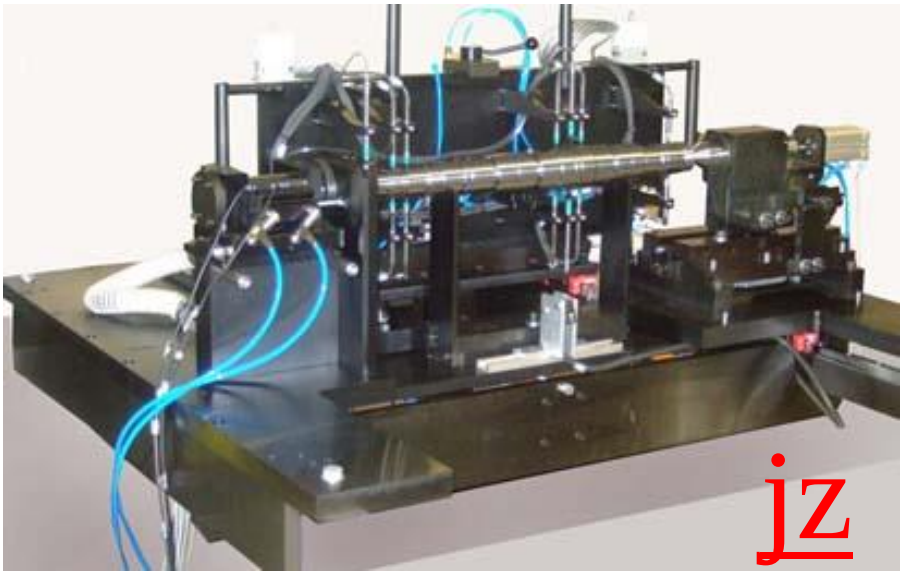
M7005 User Manual



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1 General

M7005 is the successor to CE Johansson's measurement program Metem 3005. M7005 has all features that M3005 have such as

- Store measured values in the data base
- Statistical process control (SPC)
- Plc function
- Sending compensation data to machine tools
- ……..

some other

- Scanning
- Measuring roundness
- Built-in help texts
- Measurement system analysis , MSA
- Executes under Windows 7/8
- ……..

Two versions

M7005 is available in two versions, a standard version and a slimmed-down M7005s where the "s" stands for small. The difference is that the "small" version has no Spc features.

1.1 M7005

1.1.1 Notation

Sequences of clicks to get to a particular images or forms are put in quotation marks and separated by /. For example, if you want to get the image for the graphic display of XBarR chart you should go by "Show/XBar-R/Graphical".

If you want to achieve something by pushing two or more keys simultaneously, is it described in the same way but without quotes. E.g. Fn/Alt/PrtScn takes a copy of the current image to the Windows Clipboard "".

What and how a detail to be measured is defined in the M7005:s measurement program. Measuring programs can also sometimes referred to as measuring cases.

Figure 1.1 M7005:s Dimensions display picture

1.2 Thought example "Step"

This guide uses a consistent example of measurement consist of 3 lengths witch are measured by three transducers. The example measurement program is called Step and are described in Appendix A.

1.3 Requirements

M7005 does not have any special demands on the computer which is used as long as it is reasonably modern (April 2015).

1.4 Installation of M7005

Along with M7005 is a Setup instruction.

Normally the Setup program takes care of everything. What an M7005 installation includes (libraries and files) and where they are placed see manual *M7005 – Files, Libraries and the Database design*).

1.5 Absolute vs. Relative mode

M7005 can be in two different States, either displays all data belonging to a measure (its measured value, tolerance, and master deviation mm) relative to the nominal value. M7005 is said to be in relative mode. Or are values absolute i.e. the value is = (deviation from the nominal dimension) + (nominal dimension) and then we say that the M7005 is in absolute mode. In what mode a measurement program works, is chosen when the measurement program is defined.

1.6 Help

Built-in Help

M7005 has a built-in help accessed either by clicking on "help" on the menu bar or by placing the pointer on the area you want help with, and then right-click with the mouse. Is there a help text for the field, a "help" button is shown on the screen. Click on it and the text is displayed.

Hint" Texts

For some buttons, fields, symbols there are built-in "hint texts". For example if you put the mouse pointer over the icon displays an explanatory text for a limited time. If you set the mouse pointer on the turquoise ring Tol in Figure 1.1 the text "Show tolerances" appears.

M7005: s Home Page

M7005 has its own website M7005. metem.se where you can find more information on the program, for example, you can download manuals and articles. There is also a log of errors/problems that has been discovered.

2 Handling

Here below are a number of features that the operator can perform when the M7005 is running.

Remark.
To add a button in the Buttons Panel, do it by "Tools/ Adjust Status- and Button Panel ...", see section 2.8 below.

2.1 Start/Stop

Start

The executable program is named M7005, and have the icon.
Click the icon to start M7005.

Stop

M7005 stops by clicking on the icon at the top right corner. If you want you can put out a Close button in the Buttons Panel.

2.2 Mastering

A mastering starts by the menu bar "Tools/Mastering" or by clicking on the Mastering Button, if it is placed on the Buttons Panel.

When you have requested mastering will sign in Figure 2.1 show up

Figure 2.1 Mastering

The operator clicks "OK", and after a short moment the sign in Figure 2.2 appears.

Figure 2.2 Mastering finished.

Measuring program divided into sequences

If the measurement is divided into a number of sequences and all dimensions should not be mastered all together, a sign will be shown after each sequence is mastered. For more information see manual M7005 – Measurement Program divided into Sequences).

2.3 Change the measurement program

Replacement of the measurement program is done by the menu bar "Tools/Change Measurement Program" or by the drop down menu as shown in Figure 2.4 below.

If the button is in the buttons Panel, you can also click on it.

All three ways will take up the image, Figure 2.3, in which you mark the measurement program you want to be active when you click on "Open".

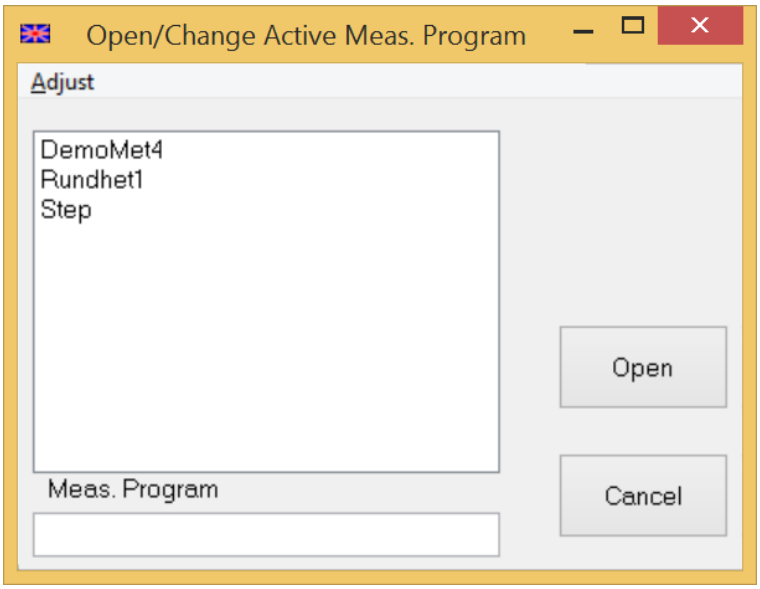


Figure 2.3. Window for selection of Measurement Program

If you click on the menu bar "Meas.Programs", a drop down list will appear. See figure 2.4. The lower part contains the latest used measurement programs.

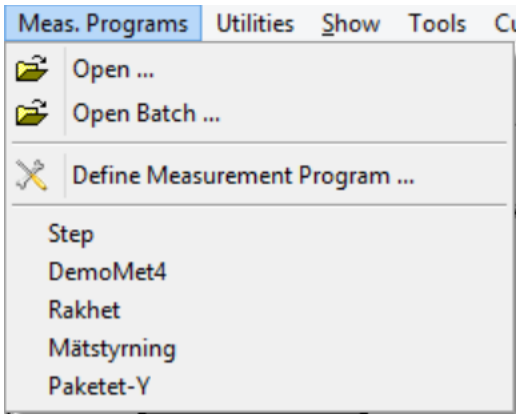


Figure 2.4 the drop-down menu with the latest used measurement programs

How many measurement program to be displayed is provided by the "Customize/Outlook" “Max number” field, see section 3.1.4. If you want to remove a program from the list, pressing the Delete button on the keyboard, while you click on the program you want to remove from the list.

Change of active measurement program is confirmed by the sign in Figure 2.5.

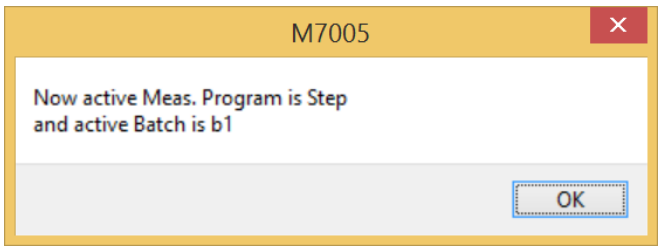


Figure 2.5 Confirmation that current measurement program is changed.

2.4 Change Active Batch

Changing the batch is done by the menu bar "Tools/Change Batch"

or by the drop down menu as shown in Figure 2.4. If the button

is in the Buttons Panel, you can also click on the.

All three ways will show up the image in Figure 2.6. You select the batch to be the active batch when you click on "Open". If you want to start a whole new batch, writes its name in the “Batch” input field and then click "Open".

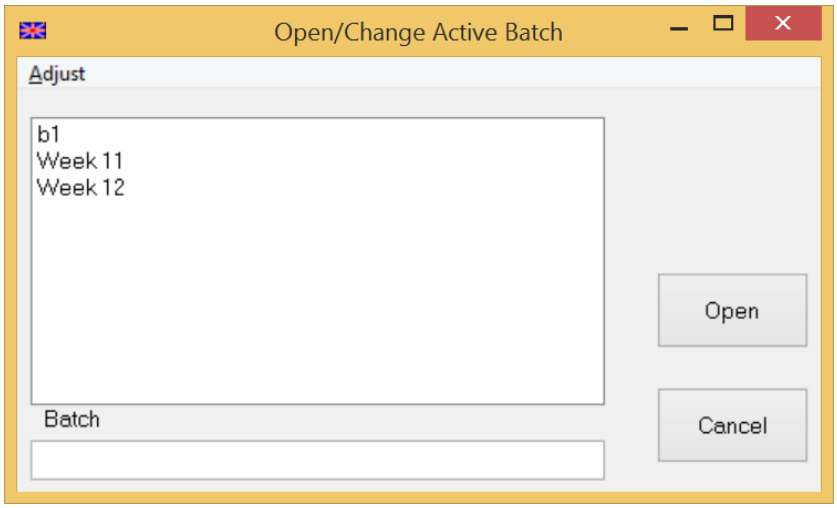


Figure 2.6. Window to switch/start a new batch

2.5 Manual Input

If we have a measurement program with dimensions that have Mode set to Man.Input. You can get the form for input of the dimension values from the keyboard, by menu bar "Tools/ Give Measurements"
or by clicking on the button

in the Button Panel.

If we have specified that the first and second measure in the measurement program Step to get there values from the keyboard, instead from transducers, the input form is shown in Figure 2.7. A click on "Register" saved measurement values in the database.

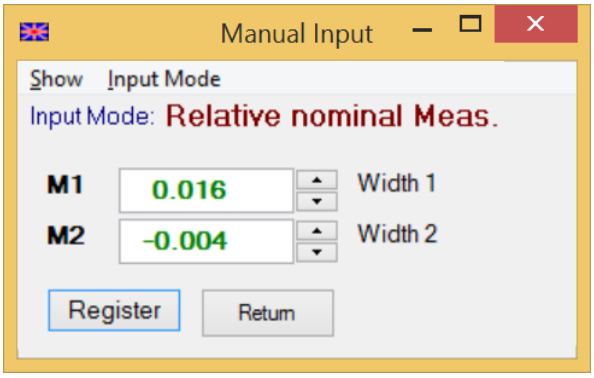


Figure 2.7. Form to give measure M1 and M2 values from the keyboard or the up/down arrows.

To define a dimension to have their values from the keyboard is done when you define its dimensions refer to section 6.3. You also define the up/down arrows increases/ decrease step size.

2.6 Give Part ID

You can assign each made measuring a identity, Part ID. You do it in the form shown in Figure 2.8..

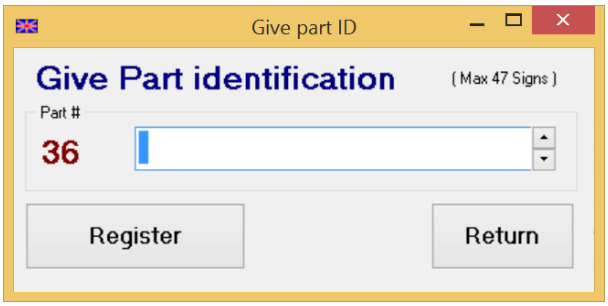


Figure 2.8. Form to give a measurement (here no 36) an identity.

The form shows automatically if you have defined it when you set up the measurement program "Define Measurement Programs/ More add on", see section 6.2 – “Give the detail ID”. You can of course also get it displayed by the menu bar "Tools/Give Detail ID" or by the button

If it is on the Button Panel.

2.7 Start a new statistic group

You can start a new data group from the menu "Tools /Start new statistic group" or by clicking New-statistics-group button if it is on the Button Panel.

To avoid mistakes, the sign in Figure 2.9 shows up, and the operator must confirm that the program will put the next measurement values as the first values in the new data group.

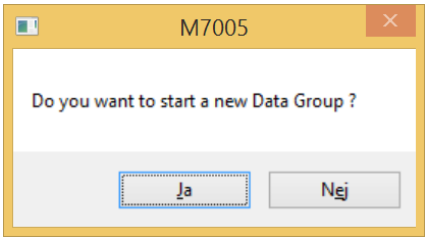


Figure 2.9

2.8 Adjust Status- and Button Panel

The outlook at the Status Bar and the Button Panel, can be change to suit your preferences. This is done using the form shown in Figure 2.10, and you get it from the menu bar "Tools/ Adjust Status- and Button Panel".

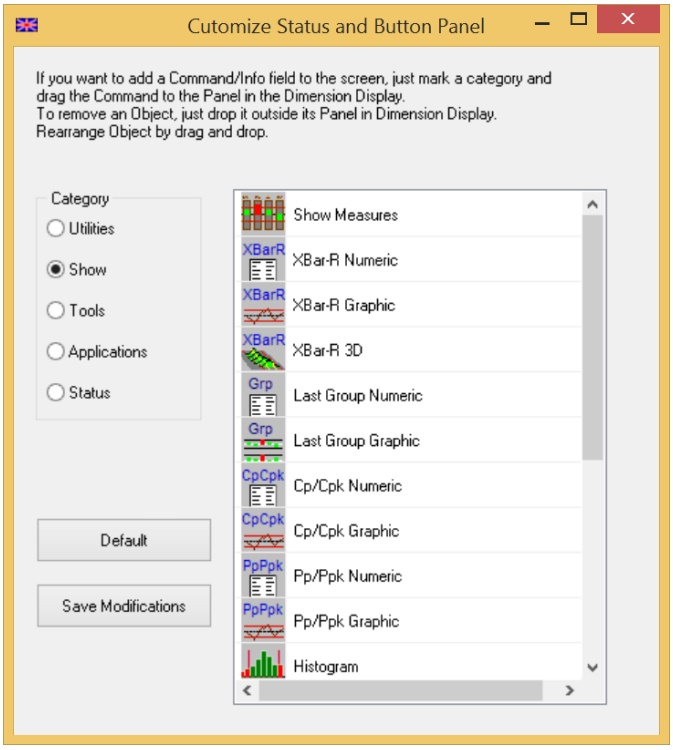


Figure 2.10. Form to customize Status Panel and/or Button Panel

2.9 Backup

By the menu bar "Tools/Backup" form in Figure 2.11 is displayed.

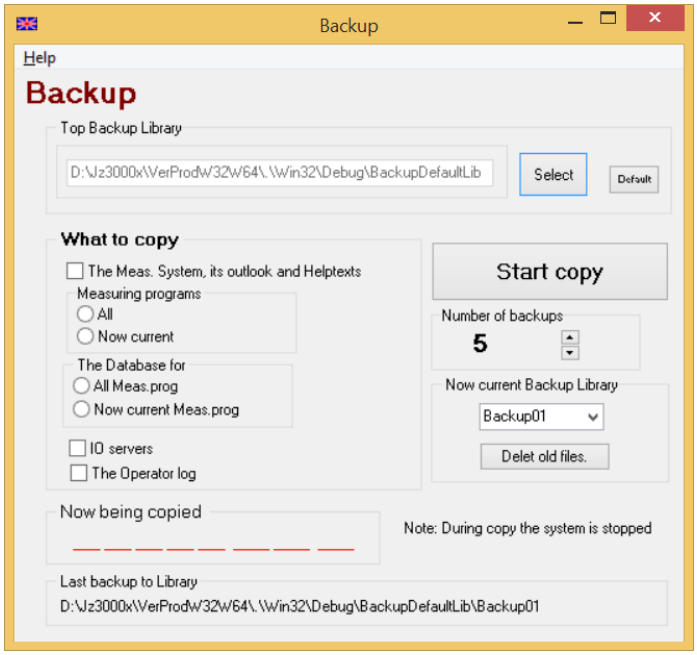


Figure 2.11 Form for backup.

Backup makes a copy of the selected files and libraries from the measurement system to the library BackupXX which is located under the library you specified in the "Top Backup Library". XX is the number of the now current generation. Copied files and libraries are created under BackupXX with the same structure as they have in the measuring system. For more information about the file system, see manual ' The Measuring system M7005 – Files, Librarys and the Database design).

Restore from Backup

If you want to recreate the copied files/libraries, you have to do it by hand with the help of Windows Explorer.

Top Backup Library

Here you can choose the library in which BackupXX is added. (xx = 01 to "number of generations"). When the maximum number of generations are used the backup system starts from the beginning with Backup01. Are you not satisfied with the default library, you can change the library in the box "Top Backup Library".

If you click on the button "Default" the top library sets to zz\BackupDefaultLib where zz = the library in which the measurement system (M7005. exe) is located.

What to copy

Here you select what you want to back up

The measuring system, its outlook and Help texts

The program M7005.exe file and the contents of the library SysParamLib are copied.

Measuring programs
All means all measurement program in the ProgramMS library are copied.

The Data base for
All means that the entire database, i.e. the library Data with all its under libraries are copied. Otherwise, the program copies only the data for the current measurement program.

IO servers
The whole IoServerLib contents is copied.

The Operator log
Copies the contents of the library MsgLogg
.

Number of backups
Number of generations of BackupXX. Data is copied to BackupXX which is located in the library specified in the "Top Backup Library". The library is changed rolling etch time the backup-program starts. Number of backups" defines max number of generations. When you have reached the maximum number, the Backup01 is reused.

Now current Backup Library
Displays the library to which the copying is done. The library can be changed using the up-down buttons.

Delete Old files
All data in the current backup library and all it's under libraries is removed.

When the copying process is completed, a sign confirms the end of the backup.

3 Result display pictures

M7005 presents the results from the measurement in a number of pictures. In common for all images they are displayed by the menus drop-down menu "Show". If the image has its icon in the Button Panel button you can show the picture by clicking at the icon. How to place a button (icon) on the button panel is described in section 2.8.

3.1 Dimension display

M7005 's main picture, Dimension display, see Figure 3.1. shows the present measured values both as bars and numeric values.

Figure 3.1 Dimension the bars starts from the goal value.

3.1.1 Tree different bar displays

The bars can view the values in three different ways. You choose the from the “Customize” drop down shown in Figure 3.2.

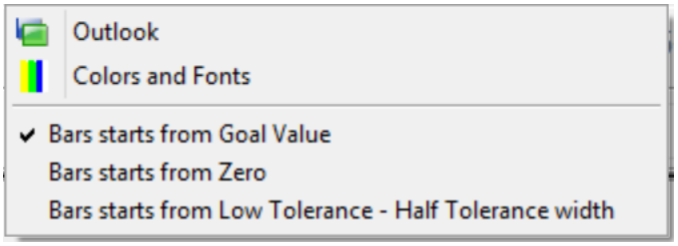

Outlook
Colors and Fonts
Bars starts from Goal Value
Bars starts from Zero
Bars starts from Low Tolerance - Half Tolerance width

Figure 3.2 The drop-down menu Customize.

The difference between the three is the bars starting point. The bars always ends in measurement value.

The bars starts from the target value

In Figure 3.1 starts the bars from the target value, witch in “Step” measurement program are set to zero.

The bars starts from zero

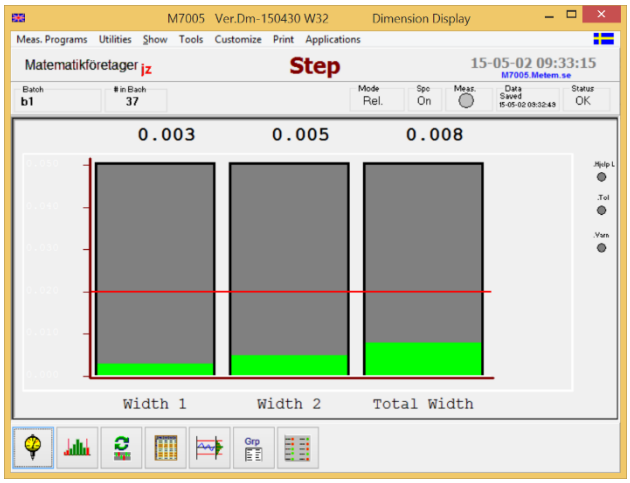


Figure 3.3 The bars starts at zero.

The bars starts from lower tolerance minus half of the tolerance width.

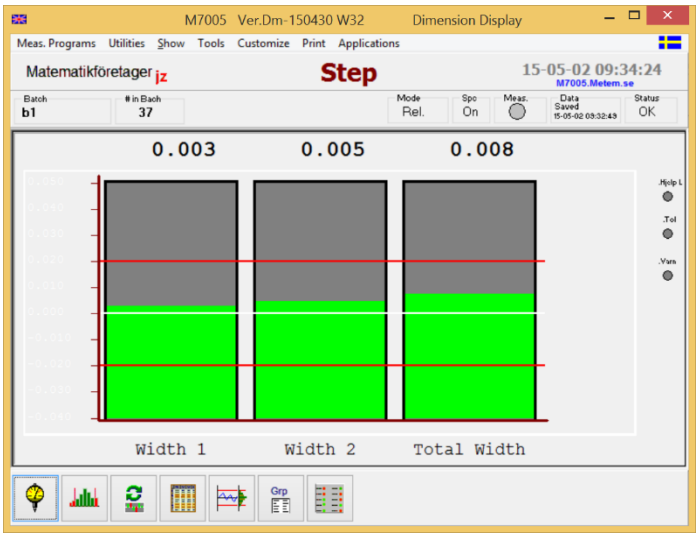


Figure 3.4 The bars starts from lower tolerance minus half tolerance width.

3.1.2 The different fields in the Status Panel

You can select witch functions you want display in the Status Panel, see section 2.8. What you have to choose from is.

Batch

Displays the name of the current batch.

Number in Batch

Number of measurements stored in the current batch.

#/Gr

is the number of the latest measurement saved in the group and Gr is the group size.

Part ID

Contains the identifier, see section 2.6 “Give Part ID”.

Mode

If the application is in relative or absolute mode, see section 1.5 “Absolute Vs Relative Mode”.

Spc

Statistical Process Control. Is the circle green (On) is the measurement saved in the database. If the circle is red (Off) the data is not saved. By clicking on the circle, you can change the setting. The ability to temporarily stop the storage of measurement data in the database gives a possibility to do a measurement without “destroying” the data base (Spc). For example if you want to measure the master to see if the system displays the master deviations.

Measuring

The ring is green as long as the measurement order is high, the measuring is in progress. You can set the measurement order by clicking on the ring.

Data

This field shows → as long as registration order is high. When the registration order goes low, the date and time of registration are shown. You click in the box to give the registration order.

Note: By clicking in the Measurement and Registration box, you set/resets the measurement / registration order. The manually settings demands no other device try to sets the orders, if so result is unpredictable.

Status

The entire system status. If the Error appears, the system should be rebooted.

3.1.3 The Circles Tol and Warn

You can by clicking the circles turn on and off the display of tolerances and warning limits numerical values. If the circles are not displayed is it because there is no room for both bars and the values. In this situation, the display of tolerances/warning limits are removed. If you make the image bigger or reduces the number of displayed bars, the circles appear again. You can set maximum bars to be displayed, see section 6.2.1 Other options.

3.1.4 ”Customize/ Outlook”

If you click on "Customize/Outlook" form in Figure 3. 5 appears.

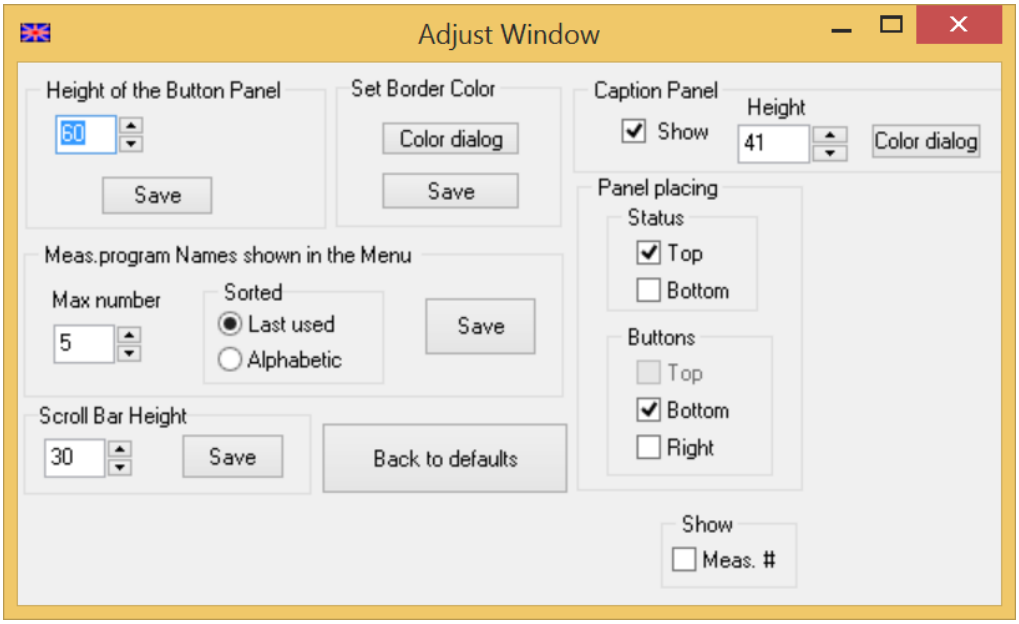


Figure 3.5 The Form to customize the Dimensions display picture.

Meas.prog names shown in the Menu. You can select the maximum number of measurement program name to be displayed in the drop-down menu" Meas.Programs ". Figure 2.4 has set max to 5.

Show Meas #
If You want the measurement number M1, M2, M3 … to be shown before the measurements name.

Note: for certain amendments to apply, it may sometimes be necessary to restart M7005.

3.1.5 ”Customize/ Colors and Fonts”

If you click on "Customize/Colors and fonts" ,see Figure 3.2, the form in Figure 3.6 shows up.

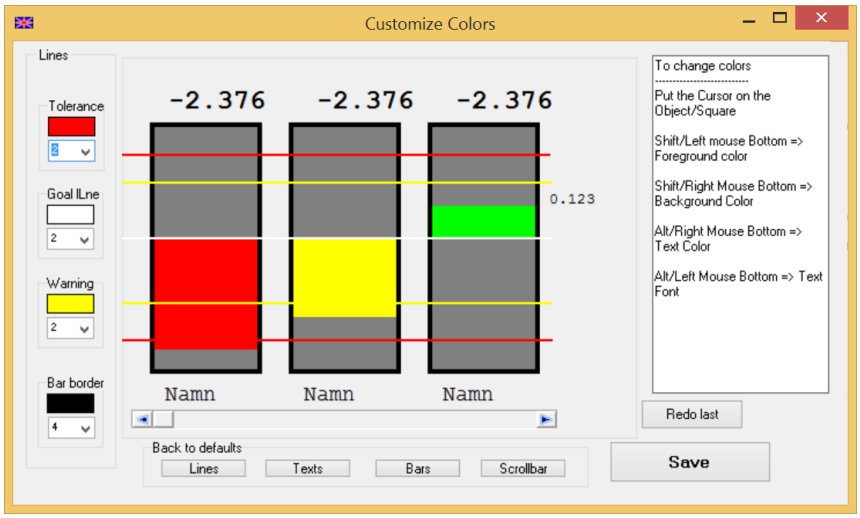


Figure 3.6 Forms in order to change the dimension display forms colors and fonts.

Here you have the opportunity to change the fonts and colors to suit your own taste.

3.2 List measures

In the dimensions list displays the individual measuring values shows either as a table, or in a chart.

3.2.1 Graphic

The chart is displayed by ”Show/List Measures/Graphic” or by the button

The graphical chart is shown in Figure 3.7, and consists of a graph and a histogram. You can choose not to view the histogram.

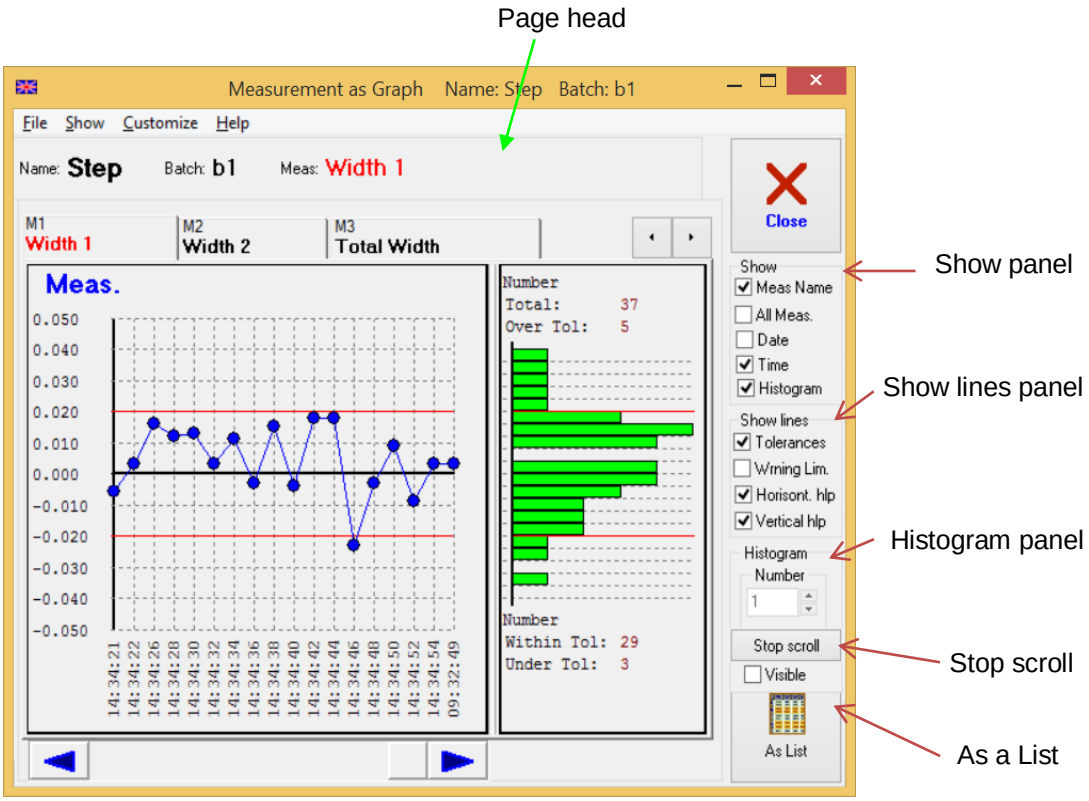


Figure 3.7 Measurements as graph

Change the size ratio between the graph and histogram

You change the proportion between the two charts by placing the pointer on the border between them, hold the right mouse button pressed and drag.

The Menu

File

”Open” opens a measurement program.
”Open Batch" sets which batch within the measurement program whose data you want to view.
”Print”
”Preview” and ”Printer setup”

Show

”As List” shows the data in a table.
”Page Header”. Here you can choose if you want the box with "Name", "Batch" and dimensions shall be shown or not.

Customize

”Customize/ Colors and Fonts”, See section 3.13.

The Show panel

Here you select what to be shown in the picture.

All Meas

If "All Meas" is not selected, only a single row of "tab" tabs displays, regardless of how many dimensions the measurement program contains.

Histogram

You select here whether the histogram will be displayed or not.

Date, Time

Select if you want the date/time displayed In the diagram

The Show lines panel

If you want the various lines shall be drawn in the chart or not.

Histogram panel

If you want the histogram to be displayed, you here decide how many values the histogram must contain.

Number

If none of the boxes "All" and "Visible" is checked, enter here the number of measurement values, the histogram will consist of. The histogram will consist of the number of measured values you entered starting with the value at the right of the chart, and the number of – 1 previous.

All

The histogram shows all measurement values in the batch.

Visible

The histogram consists of the measuring values as shown in the diagram.

The Button ”Stop scroll”

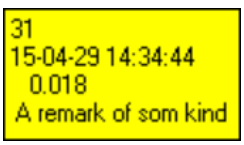
If the current measurement program (the running one) shown, updated the picture directly when a measurement is made (registration order goes low). This can be annoying if you want to look at other metrics than the last. You can then click "Stop scroll" turn off update ". If you want to start the automatic update again, just click on the button which has now changed the text to "Start scroll".

The Button ”As List”

Clicking on that button, you will see the image "Measurement list". The special thing about starting the "Measurement List" from here is that "Measurement List" is removed at the same time as this image be deleted.

The Popup image

If you click with the left mouse button on a measurement value marking, a popup window appears that contains the measuring value's, serial number, the date and time of registration as well as its numeric value. If a the measurement has a log note it also shows up..



A click on the histogram shows the number of measurements in the class.
.

3.2.2 Measurement List

Measured values are shown in tabular form. The image will be shown by "Show/ List Measures /Numeric" or using the button

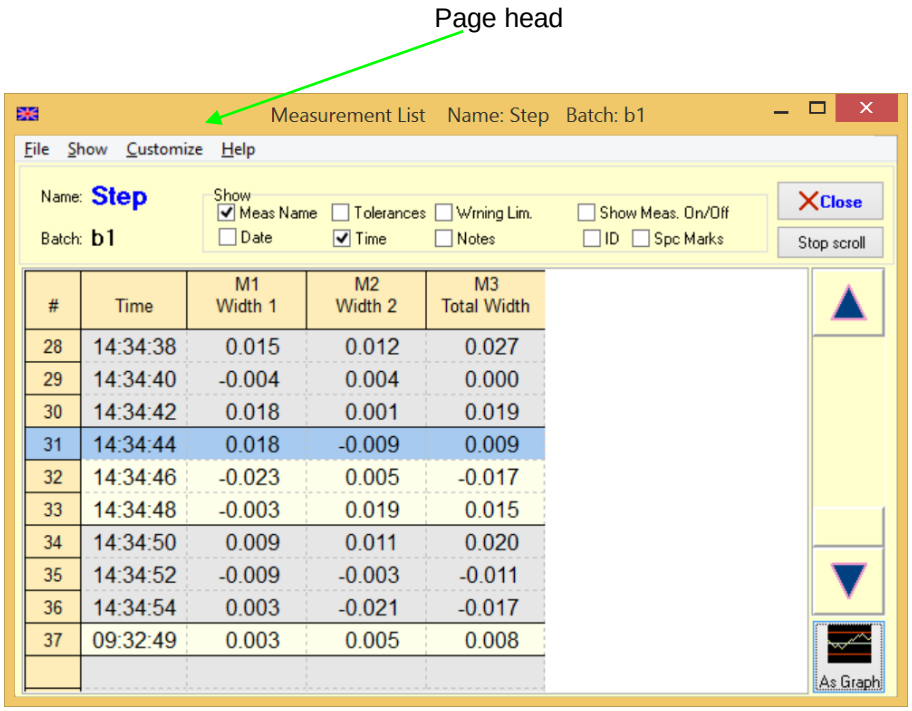


Figure 3.8 Numerical display of measured values

In this picture you can see the result of the measurements, when measurements were made and its result. Most of how and what should be displayed is selectable. Measurement values that belong to the same group of statistics are separated by a thicker line and their data have the same color.

The Menu

File

”Open” Opens the data for a measuring program
”Open Batch” You select the batch you want to display.
”Print” Prints the values selected by ”Select Meas. For Copy or Print”.
”Preview” and ”Printer Setup”.
”Copy to .txt file” copies the in ” Select Meas. For Copy or Print” selected values to selected file.

Show

”As Graph” display measurement values in a chart
”Page Header”. Here you can choose if you want the box with "Name", "Batch" and selection under the "Show", will be displayed or not
”Selection for Copy/Print”. Here you select the box "Select Meas. for Copy or Print" shall be displayed or not.
”Show options” Select if the "Show" panel in the header should be visible or not.

Customize

”Colors and Fonts ”. See section 3.13

Show

Here you select what is to be shown in the picture.

Measure name, Tolerances, Warning limits, the date and time

If the respective function must be active or not.

Show Meas On/Off

You can select if a measurement values are shown in the picture or not, by checking the measurements check box. The check boxes are only displayed if you have select ”Show Meas. On/Off” on the Show panel.

Notes

Here you select whether notes in the log book shall be displayed.

ID

Here you select whether the ID is displayed. ID give it via the form "Tools/Give Part ID".

Spc marks

Only the two first positions are used at the moment.

First position can have the following selections

J (Jumped) Skipped. Because x parts has to be skipped or because the part is a "first part" (H44 is high)
F (First) the first part of the spc group
L (Last) the last part of the spc group

Second position can have the following selections

Skipped or Why new group (part no. 1 in Group)

N (Next) The next group, normal execution
O (Operator) The operator has called for "new group"
E (Error) Any measure outside of tolerance. NOTE: The control is carried out on all the measurements in the measurement program, even those who are not “data out” dimensions.
T (Time) The time between measure of two details out of specification.
B (Batch) Start of batch or start of M7005.
1 (First part) H44 is high.

Part nr 2 in the group

E One of the XBar and R is outside the specified spc limit

Compensation sent/downloaded (Last part of the group or the one that last gave value)

S (Send) Compensation is sent to the machine tool
C (Collected) Machine tool has downloaded correction values (mean values). C overwrites S:

The Button ”Stop scroll”

For the current measurement program, the picture is updated immediately when a measurement is made (registration order goes low). This can be annoying if you want to look at other metrics than the last. You can then click "Stop scroll" to turn off update ". When you want start the automatic update again, you click on the button, which now has changed the text to "Start scroll".

The Table

The measurement values are reported in table form. The outlook of the table is defined by the checkboxes in the “Show” panel.

The show order

You can by clicking on the table header box "Date" or "Time" choose if the measurement values are displayed in ascending or descending order.

PopUp menu – Change/ Delete values

Right-click in first column (# column), a popup menu which has the following options

”Edit”. After clicking on “Edit”, you can change the measurement values in the row that is selected.

”Save” Are you satisfied with your changes and want them to be saved in the data base, click on "Save"

”Delete”. You can delete an entire measurement (whole row) by using the "Delete".

”Back” removes the popup menu.

”Help” This text shows up.

Select for copying and/or printing

If you keep the left mouse button down while you drag it up/down in the first column, you can select a number of values. Alternative set First or Last measuring value's number direct in the "Select Meas. for Copy or Print" panel.

Select Meas. for Copy or Print

“All” select all values in the batch.

“None” erase previously made marks.

Include Header when coping to .txt File

When the box is checked, a header is printed on the top of the file, and then the selected readings. If the file already contains values they disappear and are replaced by those present. When the box is not checked, the selected values are added to the file. If the file already contains values they will be left untouched and the current measuring values will be added after the existing ones.

Remark

The data copied/printed is only what is selected in the "Show" panel. Measure to be printed must also be visible i.e. its box for viewing must be checked,

The Button ”As Graph”

If you click on the button the chart in section 3.2.1dispays. The special thing about starting the graphical display here is that graphic chart will be removed at the same time as the list form.

3.3 Histogram

Image with histogram is started by "Show/Histogram" or click on the button

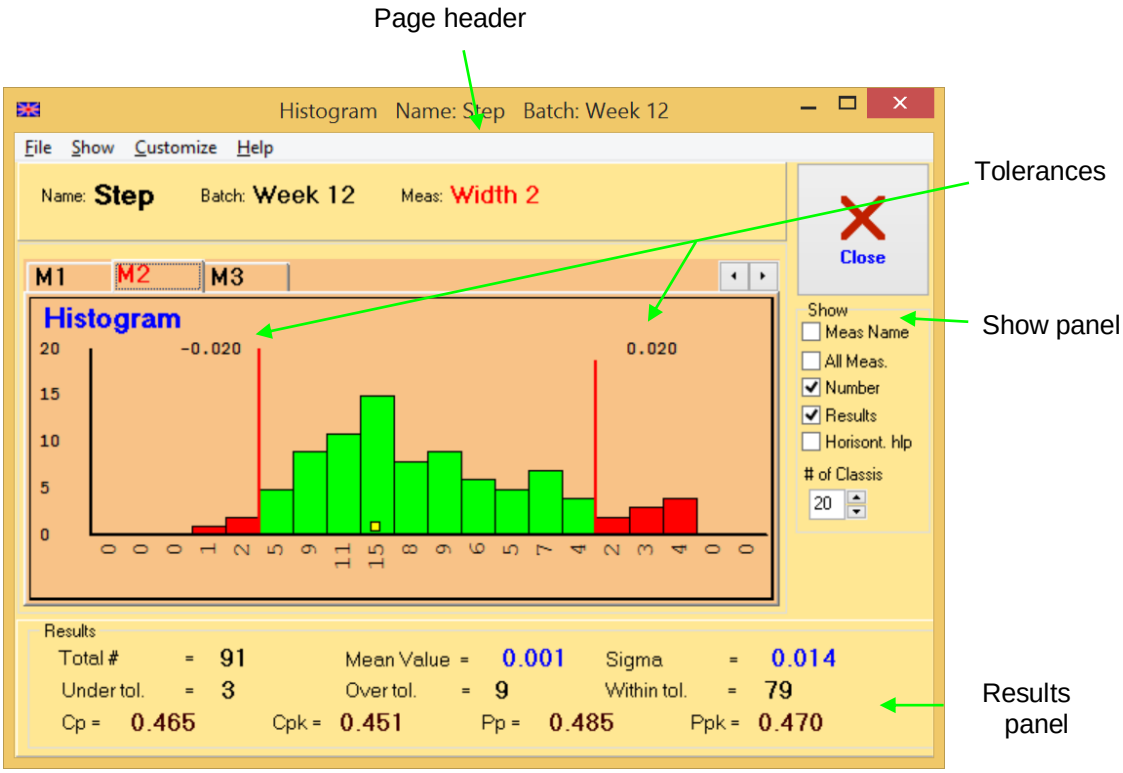


Figure 3.9 the histogram

The histogram shows all measurement values placed in classes. The width of the graph is twice the width of the tolerances. If there are values that are to the left or the right of the chart, they are included in first or last class. How many classes that the histogram shall be divided into is giving it the box "# of. Classes".
The chart also shows average, spread, number over/under tolerance and the Cp, Pp Cpk and Ppk values for the process. See Results.
The results are calculated on all values in the batch.

The Menu

File

”Open” Select measurement program
”Open Batch” Select the batch you want to study.
”Print”
”Preview” and ”Printer Setup”

Show

”Page Header”. You can choose if you want the panel with "Name", "Batch" and “Meas.” to be displayed or not.

Customize

”Color and Fonts”. See section 3.13

The Show panel

Here you select what to be shown in the picture.

Meas Name

If the measure name should be displayed or not.

All Meas.

If "All Meas" is not selected, only a single row of "tab" tabs displays, regardless of how many dimensions the measurement program contains.

Number

If number of measurements each class contains shall be displayed or not

Results

If the total number, the number of above/below tolerances, average, deviations, Cp, Cpk, Pp, Ppk will be shown or not.

Horisont. hlp

If the horizontal dashed help lines is displayed or not

# of Classes

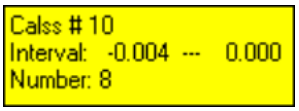
The number of classes that measured values are divided into (from 12 to 400 in steps of 4).

The Bar Chart

A yellow square marks where the last measurement is landed

The Chart PopUP

Clicking with the left mouse button on a bar, you will see a box that declares what class it is, its class limits and number of measurement values it contains.



Note: There can be minor differences between the number in the various classes in this histogram and in the “Measurement List” form The differences is caused by a rounding error for measured values located on a class boundary and it has to do with the computer's way of dealing with floating point numbers. The measuring values of the tolerances is handled separately.

The Results Panel

Here are the results of all in the batch include measurement values.

The differences between Cp/Cpk och Pp/Ppk

The difference between Cp/Cpk and Pp/Ppk is the various way to calculate the deviation. CP/Cpk using RBar where RBar average of all groups R values, while the Pp/Ppk uses the standard deviation calculated on all the batch values.

Pp/Ppk thus takes into account whether the group average is target centered, or not. Suppose we have a process (turning) where we do not compensate for tool wear. The parts will over time become slightly larger. Group averages will steadily increase. If we assume that the process is stable, the Cp/Cpk lies still on their levels, while the Pp/Ppk slowly but surely deteriorate.

3.4 Last Group

The final Group presents measurement values belong to the last group.

3.4.1 Graphic (Bar Chart)

The chart is displayed by ”Show/ Last Group/ Graphic” or by clicking on the button

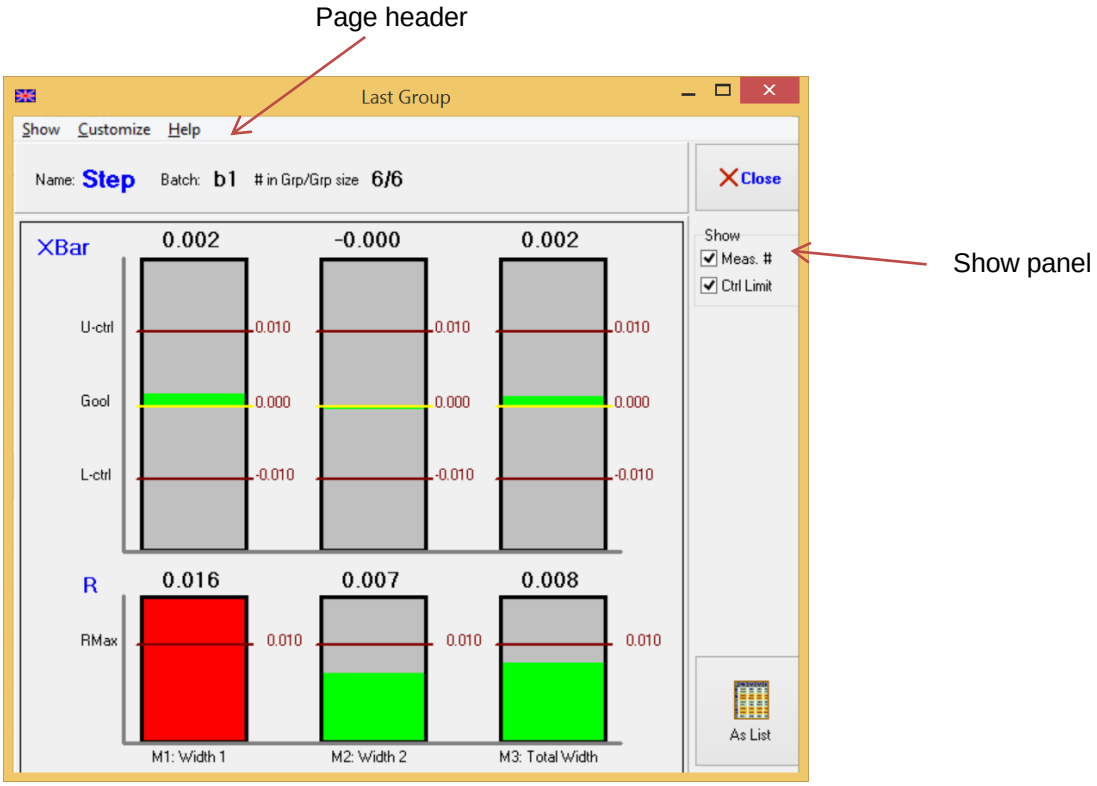


Figure 3.10 Last group, bar chart

The Menu

Show

”Page Header”. If the page header should be displayed or not.

Customize

"Customize/Colors and Fonts". See section 3.13.

The Page Header

The header contains the name of the program and the name of the batch. It also shows how many measurements the chart displays and the size of the group. The group in picture 3.10 is full. Its size is six, and the contains six measurements.

The Show Panel

You can choose if M1, M2, M3, and so on should be written before each measurement name and if the numeric values control limits should be displayed.

3.4.2 Last Group displayed as List

The form with the Last Group as a list is started by "Show/Last Group/Numeric" or click on the button

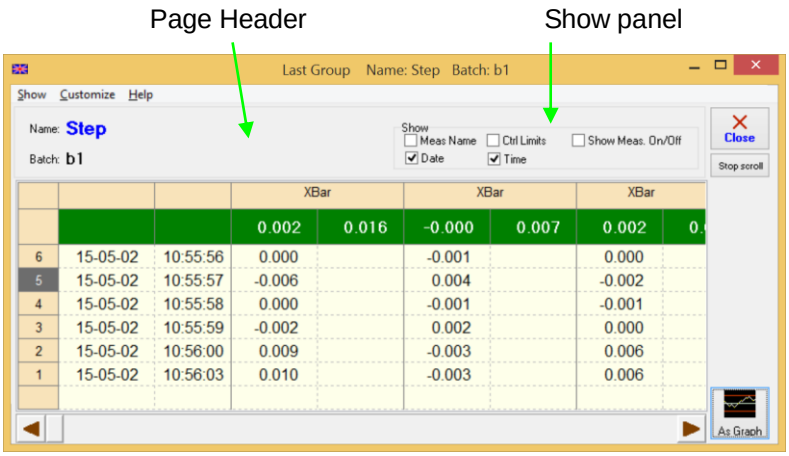


Figure 3.11 Numerical display of the Last Group.

The table shows the last group's average XBar and its deviation R. XBar and R are calculated on current group values.

The Menu

Show

”As Graph” shows the measuring values as a bar chart.
”Page Header”. Here you can choose if you want the box with "Name", "Batch" and the Show Panel, shall be displayed or not

Customize

”Color and Fonts”. See section 3.13.

The Show panel

Here you select what is to be shown in the picture.

Meas Name, Ctrl Limits, Datum, Time

If select the respective values should be displayed or not.

Show Meas. On/Off

You can select if a measurement values are shown in the picture or not, by checking the measurements check box. The check boxes are only displayed if you have selected ”Show Meas. On/Off” on the Show panel.

The Button ”Stop scroll”

For the current measurement program, the picture is updated immediately when a measurement is made (registration order goes low). This can be annoying if you want to look at other metrics than the last. You can then click "Stop scroll" to turn off update ". When you want start the automatic update again, you click on the button, which now has changed its text to "Start scroll".

The Button As Graph

Click on the button brings up the bar chart. The special thing about starting the Graphical display here is that the graphic image will be removed at the same time with this image.

3.5 Notebook

You bring up the Notebook by "Shoe /Notebook" or by the button

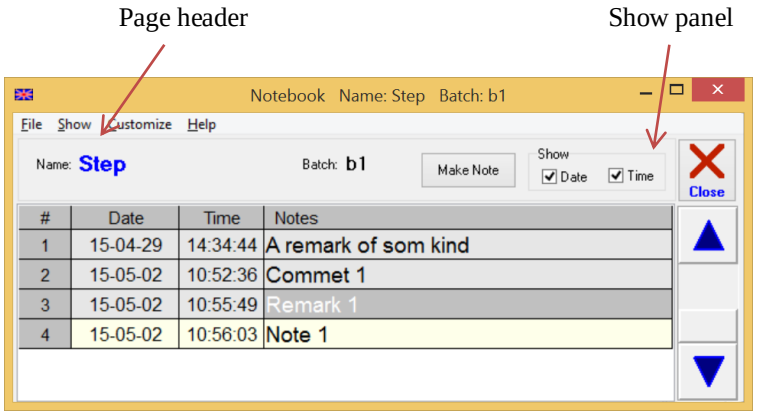


Figure 3.12 View event log entries

In this slide, the logbook records are shown. The notations are also displayed in the Measurement Listing. It is also marked with a different color in the Measurement listing as Graph.

File

- ”Open” Opens the data for a measuring program
- ”Open Batch” You select the batch you want to display.
- ”Print” Prints the logbook
- ”Preview” and ”Printer Setup”.
- ”Copy to File” Copy the logbook to selected file.

Show

”Page Header”. Here you can choose if you want the panel with "Date" and "Time” to be displayed or not

”Selection for Copy/Print”. Here you select the box "Select Meas. for Copy or Print" shall be displayed or not.

”Show options” If the "Show" panel in the header should be visible or not.

Customize

”Colors and Fonts ”. See section 3.13

The Show panel
Here you select if the date and/or time of the notes will be displayed or not.

The Button “Make Note”
When you click on the button the form to make logbook entries pops up. See below.

Change display time order
Click the "Date" or "Time" box change the display order from ascending to descending.

Change, Delete – popup menu
If you put the cursor in the No. column at the line you want to "Change/Delete" and click the right mouse button, a popup menu with the option "Change/Delete" appears.
If you select ‘Change’, the display form for the logbook note you want to change is loaded.
Choosing “Delete” a message box pops up in which you must confirm the deletion.
NOTE a deleted entry cannot be restored.

3.5.1 Make Note
If you click on the button "Make Note" in Figure 3.12 the form in Figure 3.13 is shown.

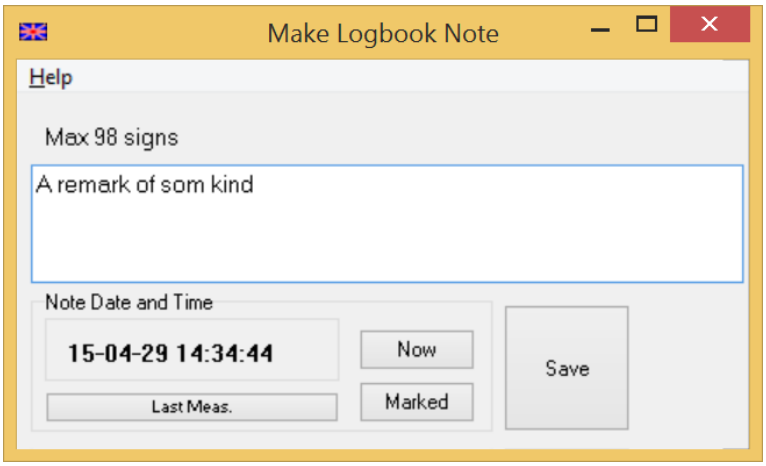


Figure 3.13 Form to give notes in the log book

In this form you write the text to be saved in the event log. Every logbook entry must be tied to a time (date and time), because it is in this way that the system connects a note with a measured value.

The Input Area
Writes the note in ordinary continuous text, max 96 characters.

Note Date and Time
A note must have a time specification in order to be saved.

Now
The note gets the current date and time. Because there is no measuring value with that time, the note is not connected to any measured value.

Last Meas
Clicking the button gets the time and date of the last measurement made. If the note is saved, it will belong to the last measurement. If a measurement occurs while "Last measure" is set, the time and date will be updated automatically with the new measuring value's time and date.

Marked
If you have selected a measurement of any of the measurement display forms and then click on this “Marked” button. The time and date of the selected measuring are used. The note it will belong to the selected measurement.

The Button “Save”
To Save the note, you have to click on the “Save” button. If no time was supplied a warning message pops up.

3.6 XBar/R

3.6.1 XBar/R as Graph
The graphical XBar/R chart displays by "Show/XBar-R/Graphic" or by the button

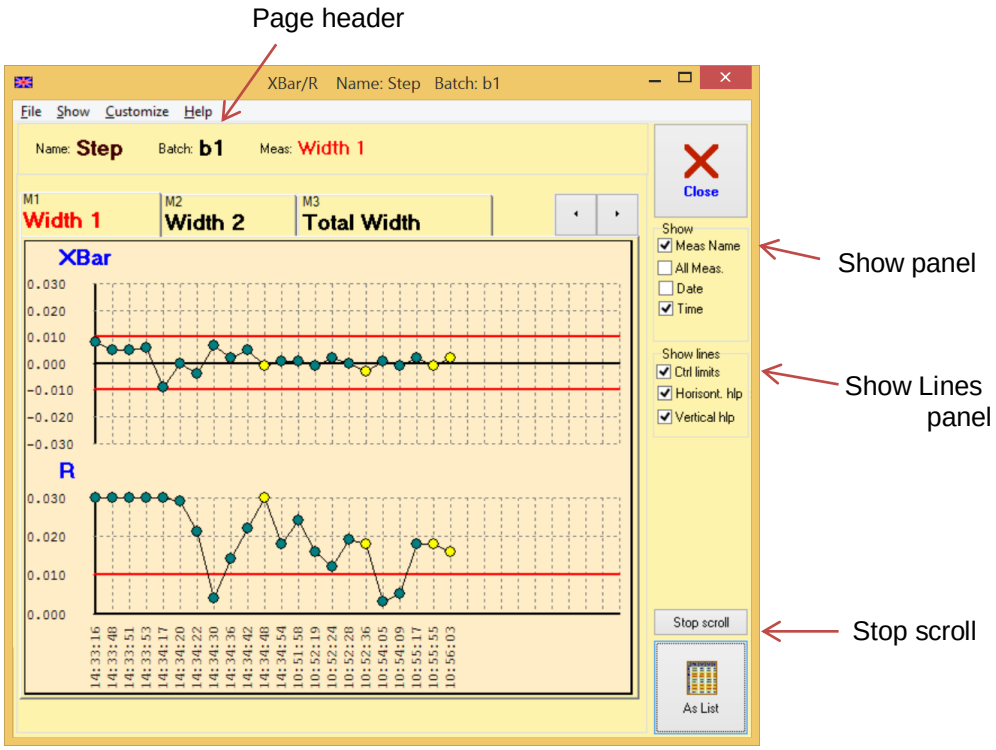


Figure 3.14 Graphic display of XBar/R

The top diagram shows the Group averages XBar while the lower chart displays spread R, where R is the difference between the largest and smallest value in the group. How many measurements a group contains is defined in the measurement program.

The Menu
File
”Open” opens a measurement program.
”Open Batch" selects batch within the measurement..
”Print”
”Preview” and ”Printer setup”

Show

”As List” shows the data in a table.

”Page Header”. Here you can choose if you want the box with "Name", "Batch" and dimensions shall be shown or not.

Customize

”Customize” Colors and Fonts”, See section 3.13.

The Show panel

Here you select what is to be shown in the picture.

Meas Name, Data and Time

Choose if the values shall be displayed or not.

All Meas

If "All Meas" is not selected, only a single row of "tab" tabs displays, regardless of how many dimensions the measurement program contains.

The Show lines panel

If you want the various lines shall be drawn in the chart or not.

The Button ”Stop scroll”

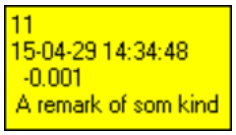
For the current measurement program, the picture is updated immediately when a measurement is made (registration order goes low). This can be annoying if you want to look at other data than the last. You can then click "Stop scroll" to turn off update ". When you then start the automatic update again, you click on the button a second time. The button has after its first click changed text to "Start scroll".

The Button ”As List”

Clicking on the button and you will see the measurement values present in a table.

The Graphic Charts Popup

If you click with the left mouse button on a measurement value marking, a popup window appears that contains the measuring value's serial number, the date and time of registration as well as the measuring value and any event log note



3.6.2 XBar/R as a List

XBar/R as List starts by ”Show/ XBar-R/ Numeric” or by the button

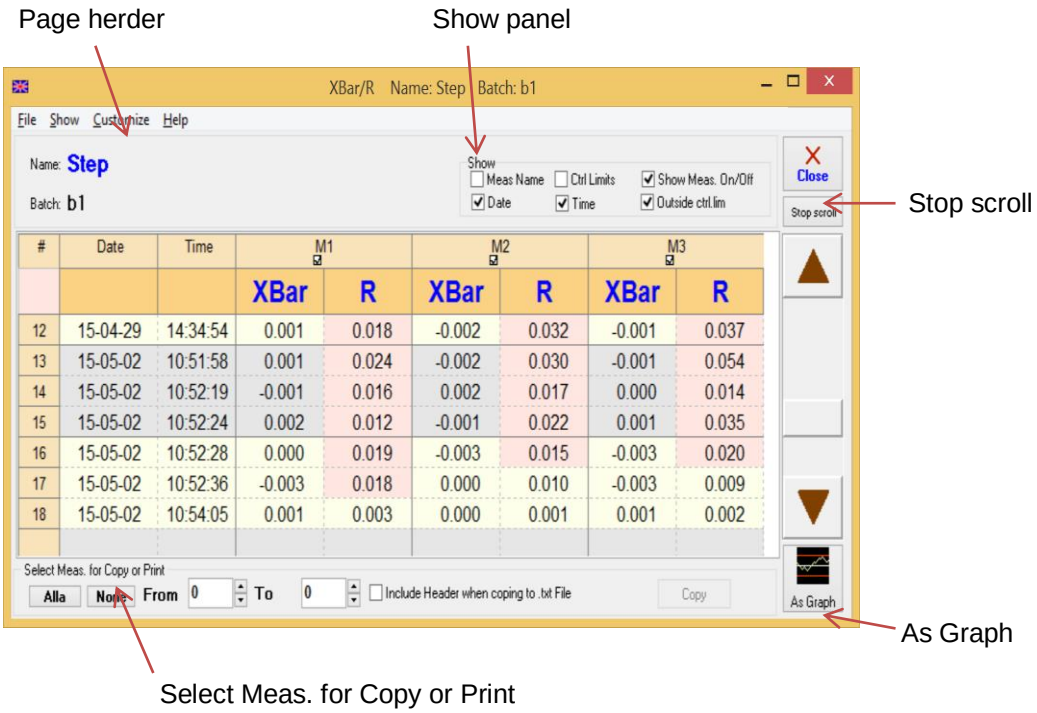

Page herder
Show panel
XBar/R Name: Step Batch: b1
File Show Customize Help
Name: Step
Batch: b1
Show
Meas Name
Ctrl Limits
Show Meas. On/Off
Date
Time
Outside ctrl.lim
Close
Stop scroll
Stop scroll
Date Time M1 M2 M3
XBar R XBar R XBar R
12 15-04-29 14:34:54 0.001 0.018 -0.002 0.032 -0.001 0.037
13 15-05-02 10:51:58 0.001 0.024 -0.002 0.030 -0.001 0.054
14 15-05-02 10:52:19 -0.001 0.016 0.002 0.017 0.000 0.014
15 15-05-02 10:52:24 0.002 0.012 -0.001 0.022 0.001 0.035
16 15-05-02 10:52:28 0.000 0.019 -0.003 0.015 -0.003 0.020
17 15-05-02 10:52:36 -0.003 0.018 0.000 0.010 -0.003 0.009
18 15-05-02 10:54:05 0.001 0.003 0.000 0.001 0.001 0.002
Select Meas. for Copy or Print
Alla
From
To
Include Header when coping to .txt File
Copy
As Graph
As Graph
Select Meas. for Copy or Print

Figure 3.15. Xbar/R as a List

In this picture you can see the result of the Group averages XBar, R groups spread and when the measurements were made. Xbar is the sum of the values divided by the number of measurements in the group. R is the difference between the largest and smallest value.
How many values a group contains is defined in the measurement program.

Most of how and what should be displayed is selectable.

In order to facilitate reading the lines are grouped three of three

The Menu

File

- ”Open” opens a measurement program.
- ”Open Batch" selects batch within the measurement program.
- ”Print” Prints the values selected by ”Select Meas. For Copy or Print”.
- ”Preview” and ”Printer setup”
- ”Copy to file” copies the in ” Select Meas. For Copy or Print” selected values to a file.

Show

”As Graph” display measurement values in a chart
”Page Header”. Here you can choose if you want the box with "Name", "Batch" and selection under the "Show", will be displayed or not
”Selection for Copy/Print”. Here you select the box "Select Meas. for Copy or Print" shall be displayed or not.
”Show options” Select if the "Show" panel in the header should be visible or not.

Customize

”Colors and Fonts ”. See section 3.13.

The Show Panel

Here you select what is to be shown in the picture.

Meas Name, Ctrl Limits, Datum, Time

If selected the respective values are displayed.

Show Meas. On/Off

You can select if a measurement values are shown in the picture or not, by checking the measurements check box. The check boxes are only displayed if you have selected ”Show Meas. On/Off” on the Show panel.

Outside control limits

If this box is checked, the values that lie outside the limit will be marked with a special background color, usually something on the red side..

The Button ”Stop scroll”

For the current measurement program, the picture is updated immediately when a measurement is made (registration order goes low). This can be annoying if you want to look at other data than the last. You can click "Stop scroll" to turn off the update. When you want to start the automatic update again, you click on the button a second time. The button has after its first click changed text to "Start scroll".

The show order

You can by clicking on the table header box "Date" or "Time" choose if the measurement values are displayed in ascending or descending order.

Select Meas. for Copy or Print

If you keep the left mouse button down while you drag it up/down in the first column, you can select a number of values. Alternative set First or Last measuring value's number direct in the "Select Meas. for Copy or Print" panel.

Include Header when coping to .txt File

When the box is checked, a header is printed on the top of file, and then the selected readings. If the file already contains the values they disappear and are replaced by those present.
When the box is not checked, the selected values are added to the file. If the file already contains the values they will be left untouched and the current measuring values will be added after the existing ones.

Remark

The data copied/printed is only what is selected in the "Show" panel. Measure to be printed must also be visible i.e. its box for viewing must be checked.

The Button “As Graph”

If you click on the button the graphic cart be displayed. The special thing about starting the graphical display here is that graphic chart will be removed at the same time with this list form.

3.7 Cp/Cpk, Pp/Ppk

CP/Cpk and Pp/Ppk forms have the same look, the difference is how the values are calculated. The graphic image below shows Cp/Cpk while the numeric displays Pp/Ppk.

3.7.1 The difference between how Cp/Cpk and Pp/Ppk is calculated

The difference between Cp/Cpk and Pp/Ppk is the different way to calculate the deviation. CP/Cpk using RBar where RBar average of all groups R values, while the Pp/Ppk uses the standard deviation for all values in the group.
Pp/Ppk thus takes into account whether the groups average are centered, or not. Suppose we have a process (turning) where we do not compensate for tool wear. The parts will over time become slightly larger. The single group averages will steadily increase. But if we assume that the process is stable the group R-value is stable. The Cp/Cpk values calculated on RBar lies still on their levels, while the Pp/Ppk slowly but surely deteriorate.

3.7.2 Cp/Cpk, Pp/Ppk as Graph

The graphic chart is displayed by "Show/Cp-Cpk/Graphic" or "Show/Pp-Ppk/Graphic" or by the button

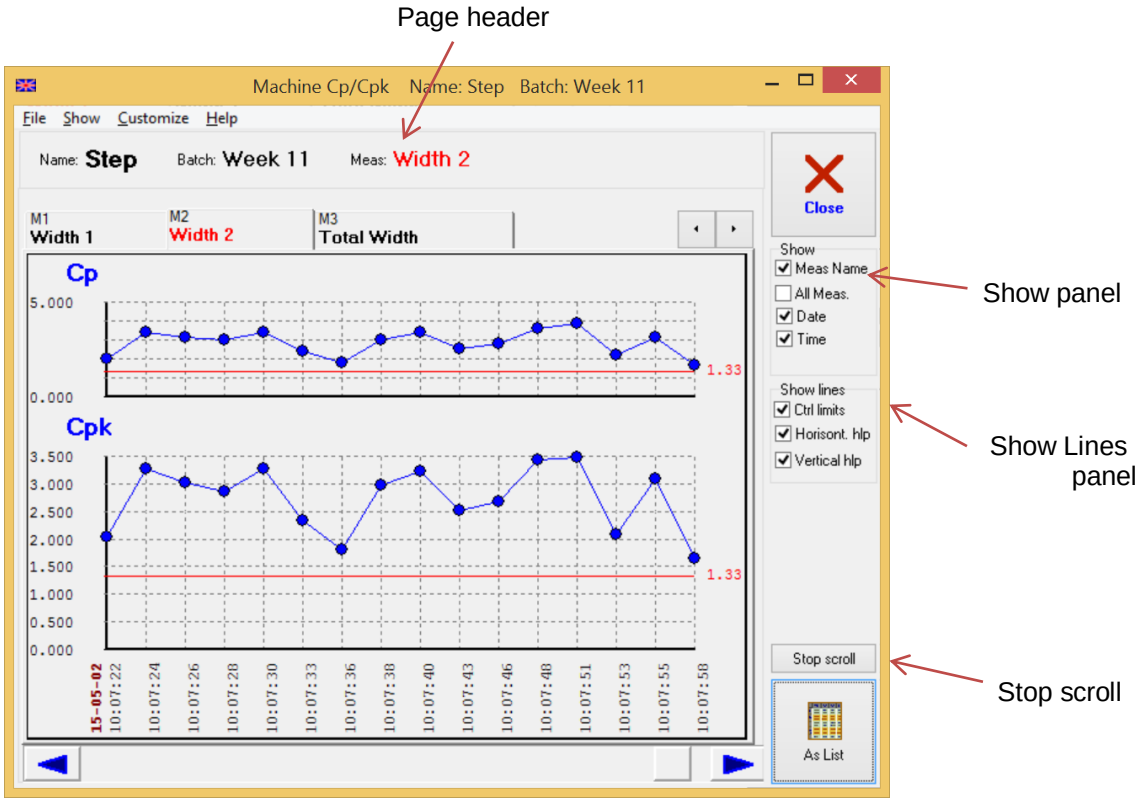


Figure 3.16 Graphic display of Cp/Cpk

The Menu

File

”Open” opens a measurement program.
”Open Batch" selects which batch within the measurement..
”Print”
”Preview” and ”Printer setup”

Show

”As List” shows the data in a table.

”Page Header”. Here you can choose if you want the box with "Name", "Batch" and dimensions shall be shown or not.

Customize

”Customize/ Colors and Fonts”, See section 3.13.

The Show panel

Here you select what is to be shown in the picture.

Meas Name, Data and Time

Choose if the values shall be displayed or not.

All Meas

If "All Meas" is not selected, only a single row of "tab" tabs displays, regardless of how many dimensions the measurement program contains.

The Show lines panel

If you want the various lines shall be drawn in the chart or not.

The Button ”Stop scroll”

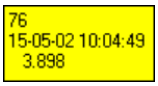
For the current measurement program, the picture is updated immediately when a measurement is made (registration order goes low). This can be annoying if you want to look at other data than the last. You can then click "Stop scroll" to turn off update ". When you want start the automatic update again, you click on the button a second time. The button has after its first click changed text to "Start scroll".

The Button ”As List”

Clicking on the button and you will see the measurement values present in a table.

The Graphic Charts Popup

If you click with the left mouse button on a measurement value marking, a popup window appears that contains the measuring value's serial number, the date and the time of registration and the value.



3.7.3 Cp/Cpk, Pp/Ppk – As List

You get the Cp/Cpk, Pp/Ppk form by "Show/Cp-Cpk/Numeric" or "Show/Pp-Ppk/Numeric" or by the button

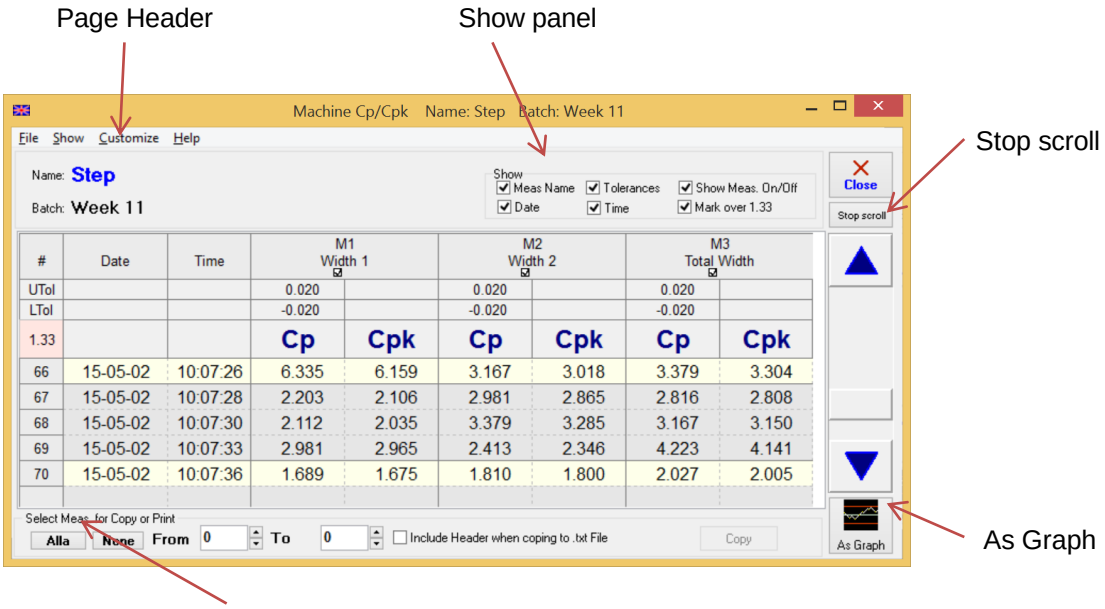

Page Header
Show panel
Machine Cp/Cpk Name: Step Batch: Week 11
File Show Customize Help
Name: Step
Batch: Week 11
Show
Meas Name
Tolerances
Show Meas. On/Off
Date
Time
Mark over 1.33
Close
Stop scroll
Stop scroll
Date Time M1 Width 1 M2 Width 2 M3 Total Width
UTol 0.020 0.020 0.020
LTol -0.020 -0.020 -0.020
1.33 Cp Cpk Cp Cpk Cp Cpk
66 15-05-02 10:07:26 6.335 6.159 3.167 3.018 3.379 3.304
67 15-05-02 10:07:28 2.203 2.106 2.981 2.865 2.816 2.808
68 15-05-02 10:07:30 2.112 2.035 3.379 3.285 3.167 3.150
69 15-05-02 10:07:33 2.981 2.965 2.413 2.346 4.223 4.141
70 15-05-02 10:07:36 1.689 1.675 1.810 1.800 2.027 2.005
Select Meas. for Copy or Print
Alla
None
From 0
To 0
Include Header when coping to .txt File
Copy
As Graph
As Graph
Select measurement values to be printed or copied.

Figure 3.17. Pp/Ppk as table

Most of how and what should be displayed is selectable.

In order to facilitate reading the lines are grouped three of three

The Menu

File

- ”Open” opens a measurement program.
- ”Open Batch" selects batch within the measurement program.
- ”Print” Prints the values selected by ”Select Meas. For Copy or Print”.
- ”Preview” and ”Printer setup”
- ”Copy to file” copies the in ” Select Meas. For Copy or Print” selected values to a file.

Show

”As Graph” display measurement values in a chart
”Page Header”. Here you can choose if you want the box with "Name", "Batch" and selection under the "Show", will be displayed or not
”Selection for Copy/Print”. Here you select if the box "Select Meas. for Copy or Print" shall be displayed or not.
”Show options” Select if the "Show" panel in the header should be visible.

Customize

”Colors and Fonts ”. See section 3.13.

The Show Panel

Here you select what is to be shown in the picture.

Meas Name, Toleranves, Datum, Time

If selected the respective values will be displayed.

Show Meas. On/Off

You can select if a measurement values are shown in the picture or not, by checking the measurements check box. The check boxes are only displayed if you have selected ”Show Meas. On/Off” on the Show panel.

Mark over 1.33

If this box is checked, the values that lie outside the 1.33 will be marked with a special background color, usually something on the red side..

The Button ”Stop scroll”

For the current measurement program, the picture is updated immediately when a measurement is made (registration order goes low). This can be annoying if you want to look at other data than the last. You can then click "Stop scroll" to turn off update ". When you want to start the automatic update again, click on the button a second time. The button has after its first click changed text to "Start scroll".

The show order

You can by clicking on the table header box "Date" or "Time" choose if the measurement values are displayed in ascending or descending order.

Select Meas. for Copy or Print

If you keep the left mouse button down while you drag it up/down in the first column, you can select a number of values. Alternative set First or Last measuring value's number direct in the "Select Meas. for Copy or Print" panel.

Include Header when copying to .txt File

When the box is checked, a header is printed on the top of file, and followed by the selected values. If the file already contains values they disappear and are replaced by those present.
When the box is not checked, the selected values are added to the file. If the file already contains the values the new values are appended.

Remark

The data copied/printed is only what is selected in the "Show" panel. Measure to be printed must also be visible i.e. its box for viewing must be checked.

The Button “As Graph”

If you click on the button the graphic cart be displayed. The special thing about starting the graphical display here is that graphic chart will be removed at the same time with this list form.

3.8 Digital IO and Help Flags

To bring up the image that shows the digital in/outputs (Ixx/Qxx), the help bits (Hxx) and S-flags (Sxx) use "Show/ Show digital registers" or by clicking on the button

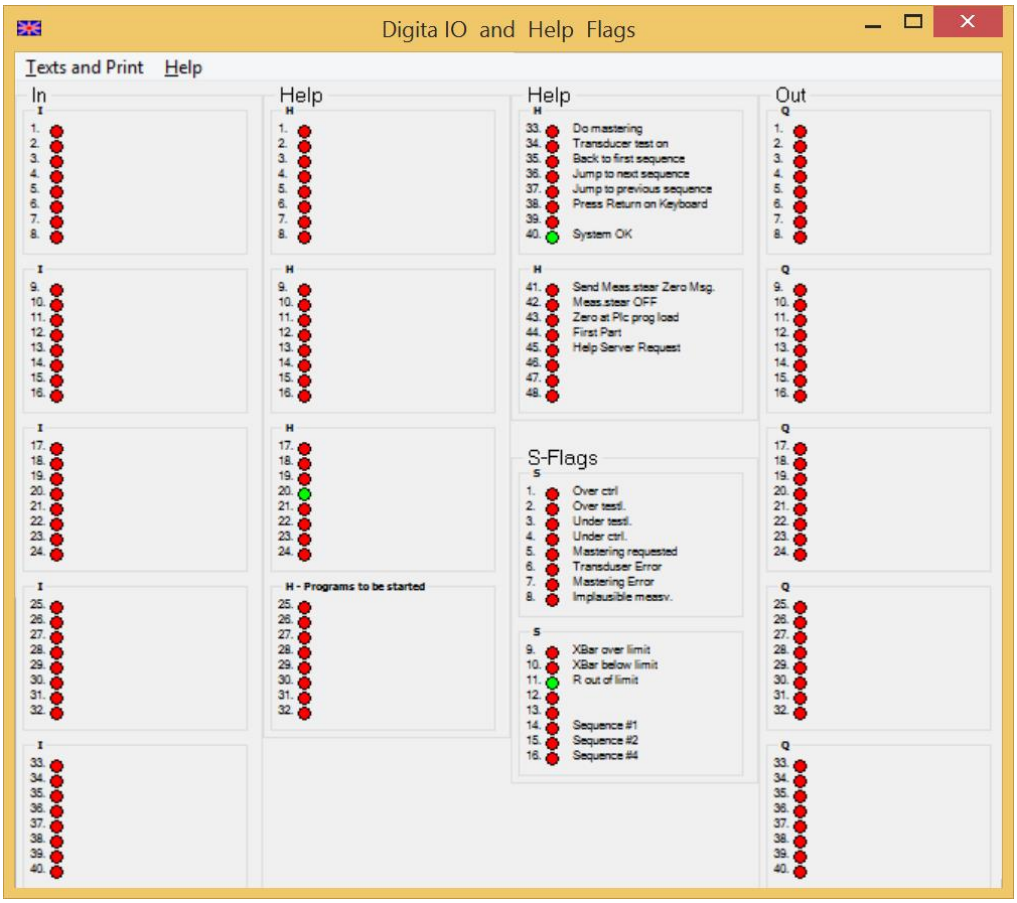


Figure 3.20. The form shows the digital IO, H and S bits.

The digital bits are used by the programs, plc program and other functions in the system.

The bits function are described in "Appendix B-The Digital bits I, Q, H and S meaning"

3.8.1 The form “Digital IO and Help Flags

The form shows the input signals I1 – i40, the help bits H1-H48, the result bits S1 — S16 and the digital output bits Q1-Q40, values. Green means that the bit is set (true = 1) and Red that it is false (= 0).

H25-H48, S1 — S16 have fixed meanings, what other H-bit means is up to the individual system. To facilitate understanding, you can assign the bits a text e.g., I1 Reg. button, I2 Measuring button, Q1 Part Ok etc.

Assign bits explanatory texts- the drop down menu

By clicking the drop down menus "Texts and Print" and then "Give texts" you can give each bit a text. The texts are saved when you click "Save Text" in the drop down menu and you return back to normal view by clicking. "Show Normal "

Print

"Print" copies the image to the printer.

3.9 The form “Transducer Display”

The image shows the transducer values exactly as they are received by M7005.To get it up, use "Show/Transducer Display" or by clicking on the button

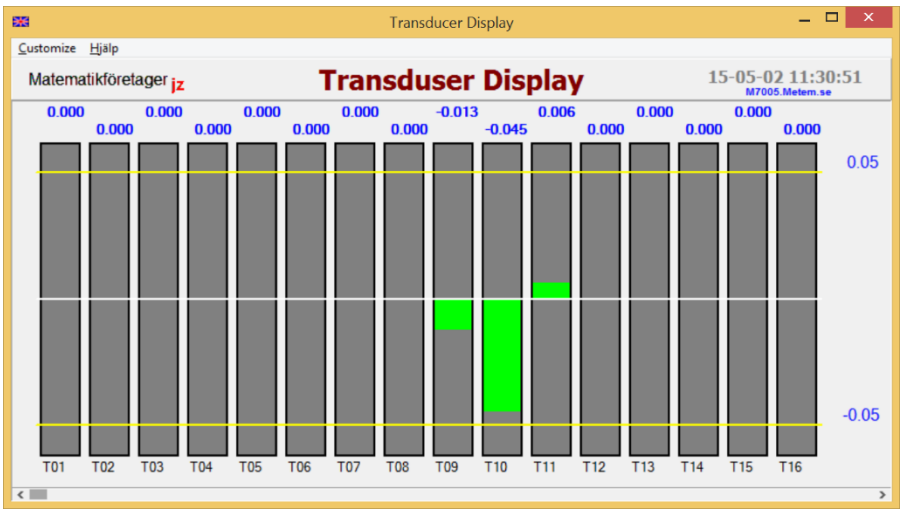


Figure 3.21. Transducer display

The drop down menus “Customize” has tree options

- Specify Transducer
- Outlook
- Colors

Outlook

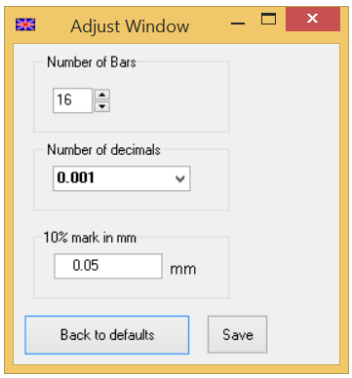


Figure 3.22. Form to customize the appearance of Transducer Display form

Number of decimal = the number of decimals the numerical display shall show.

10% mark in mm.
The Display Transducer screening has two markings (lines) which is 10% from the top and bottom of the transducer bars. You set this value in mm. The middle line is always zero for transducer values.

Colors

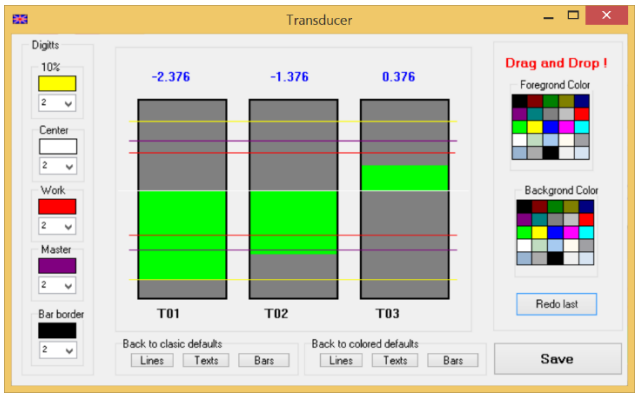


Figure 3.23. Form for coloring the Transducer Display picture.

If you do not want to drag and drop colors, you can bring up the usual color setting map by placing the pointer on the object you want to recolor, and then hold down the ALT KEY while clicking with the left mouse button.

3.9.1 Specify Transducers

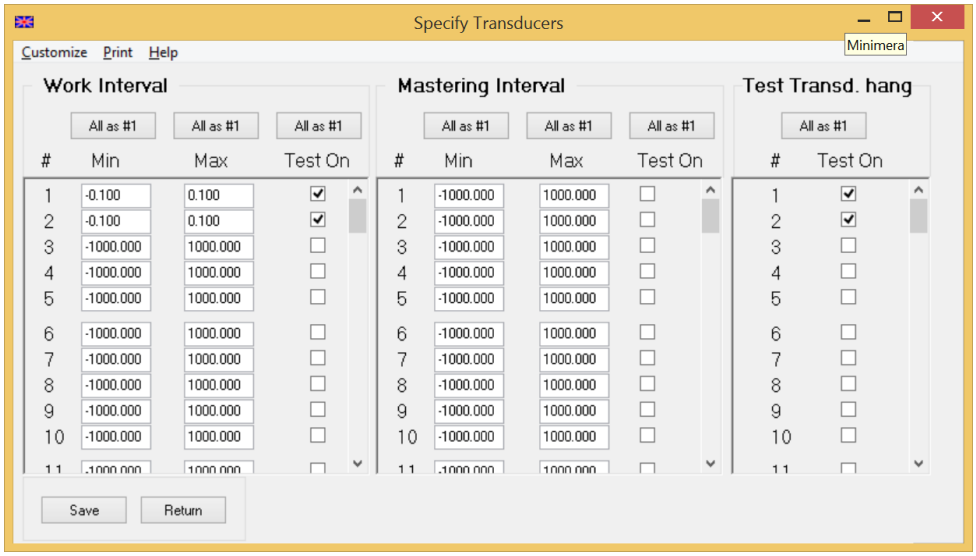


Figure 3.24. Form to specify the transducers

This form specifies the range within which the transducer must work while measuring and the range within which the transducer value shall be in mastering. You must also specify whether the tests should be switched on or off. The conditions for a transducer to be tested is that its test is switched on and the Plc bit H34 (Transducer test) is true (= 1).
It's just the transducers used in the measurement program that is included in the tests. Is measurement program divided into sequences, only the transducers belonging to the current sequence are tested. When changing to the next sequence, the transducers in that sequence are tested and so on. If any transducer is not within its range, a sign pops up telling you which transducer causes the trouble.
The flag S6 , Transducer Error, set = 1 when an error occurs.
If the operator responds "OK" on the error message but he hasn't corrected the error, the error message pops up again.

There is also a test to check if a transducer is stuck. The criterion is that they are not moved more than 0.1 mm during the measurement (when measuring order is high). If a transducer gets stuck a sign pops up on the monitor then the registration order goes low. S6 sets = 0 then operator acknowledges error message.
Is an error detected during the mastering flag S7 sets = 1 Master Error. S7 is zeroed always when mastering starts. If the operator answers "no" to the question "Continuing mastering ?" the mastering is interrupted and mastering values remains unchanged. Does he replies "Yes" new mastering values is calculated and stored.
For more information, se section 8,

The Menu
The menu has 2 drop down entries

- "Outlook" provides a window where you can specify the number of decimal to be displayed
- "Print" contains "Print", "Preview" and "printer setup".

Work Interval
Here you give the limits (Min, Max) within the transducer shall be working during the measurement. To activate the test, check the box "Test on";

Mastering interval
The limits (Min, Max) within the transducer must be during the mastering. "Test on" activate the test.

The buttons Save and Return
You must click "Save" to save made changes. "Return" is the same thing as clicking the x at the top right. If you made changes and try to exit without saving a pop up will reminder to save.

3.10 The system Log

The system message logs form is shown by the menu entry ”Show/ System Messages Log”.

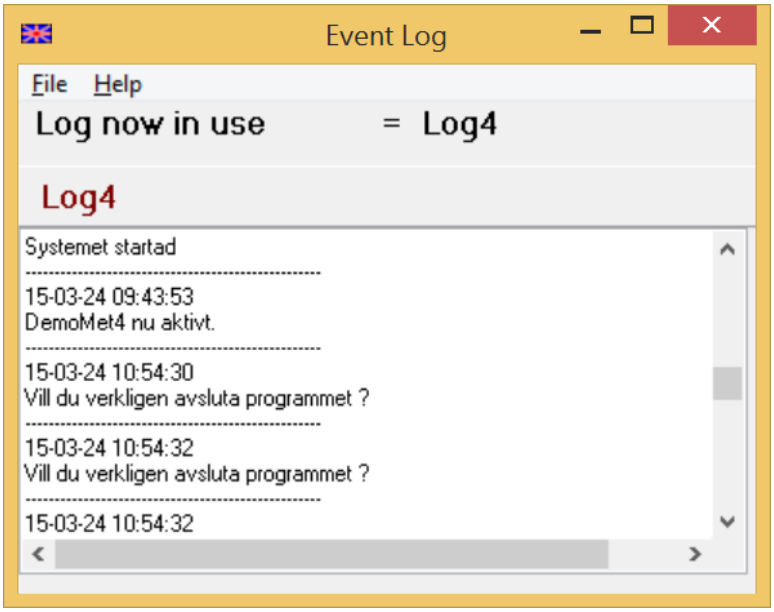


Figure 3.25. M7005 log.

The contents of the system messages are logged and displayed here. System log consists of 5 files witch changed cyclically as they become full. When Log5.txt becomes full the system reuse Log1.txt and so on.
You can open another log fil by “File/ Open”

3.11 Mastering Drift Log

The image showing “The mastering drift” gets up by "Shoe/Mastering Drift"

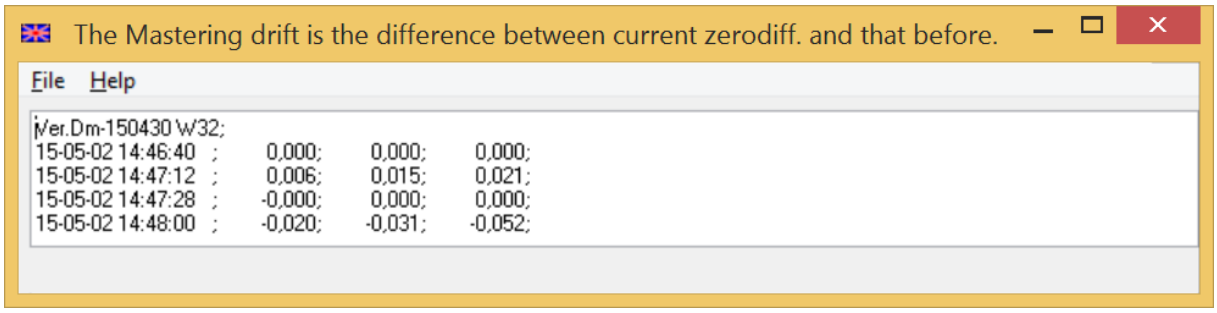


Figure 3.26. The Mastering Drift

The log contains the difference between latest mastering and the mastering before that, and the time and date when the mastering was made.
The first line indicates the version of the system that is running.
The first column is the date and time, then the measure one's drift, measure tow drift and so on.

Copy to txt file
The log can be copied to an ordinary text file.

Zero difference

A measurements value = the value its formula gives with current sensor values + zero difference

The zero difference is the master deviation minus the value given by the formula with the transducer values collected at the mastering point of time.

Assume the following example:
Measured deviation is 0.015 mm. If the formula at mastering gives 0.217 mm it gives the zero difference 0.015-0.217 = -0.202. If we when we do the measure the formula gives 0.222 mm, the measurement value is = 0 222 + (-0.202) = 0.020.

If we at the next mastering gets a zero difference at -0.220. We have mastering drift equals -0.220-(-0.202) = -0.018. Either the master become smaller or the sensor is moved, or both. Something has happened, for example the fixture (measuring equipment) have warmed up more than the master or???

3.12 Change Color and Fonts

For many of the form you change colors and fonts in a similar way.

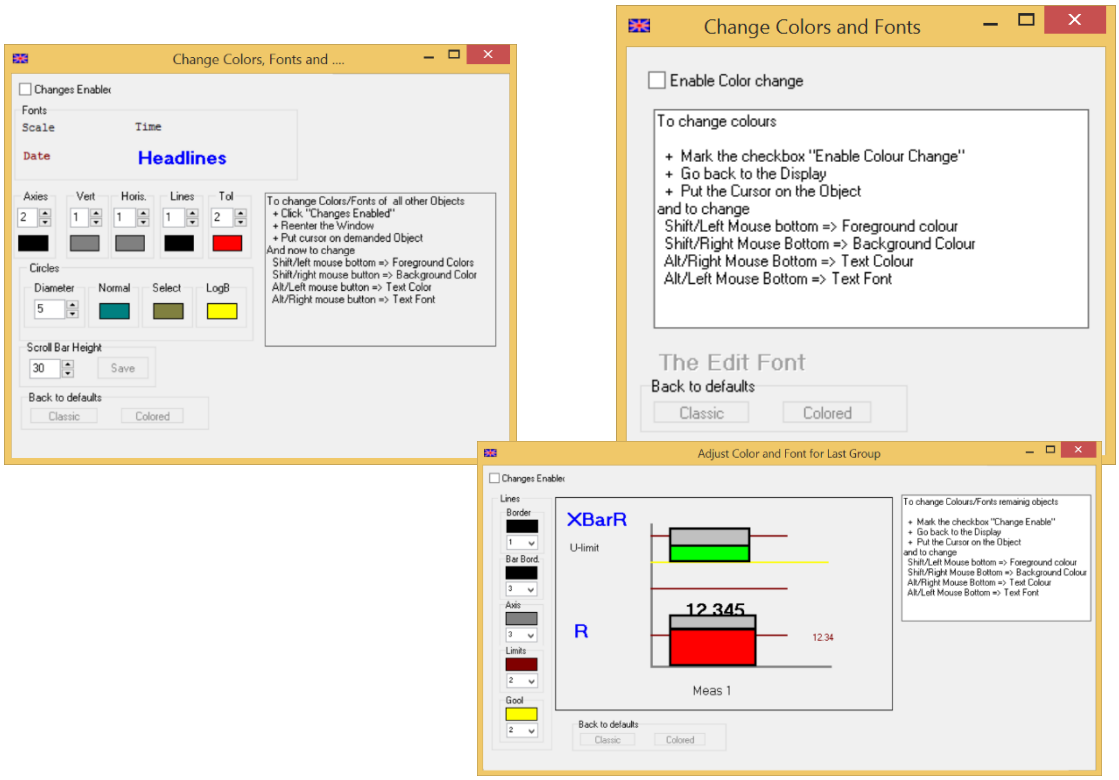


Figure 3.27 Forms to change colors and fonts.

If you want to make any changes, we must check the "Changes Enabled" box.

To change the size (line width, circle diameter mm) using the up/down arrows. For all other objects in the picture, set to the pointer to the object, and then use the

- Shift-left mouse button to change the foreground color
- Shift/right mouse button to change the background color
- Alt/right mouse button to change the color of the texts
- Alt/left mouse button to change the font.

To change other objects, such as background color you have to

- Select "Changes enabled"
- Close the form, click on the x in the top right corner of the form.
- Put the pointer on the object you want to change
- Then use “Shift-left” mouse button to change the foreground color, “Shift/right” mouse button to change the background color, “Alt/right” mouse button to change the text color, “Alt/left” mouse button to change the font.

Back to defaults

The system has two sets of default values on colors and fonts. A classical, a little community gray and a little more colorful. Just click on the respective button and form is repainted.

Made changes takes effect immediately and is saved when the window is closed.

4 Print

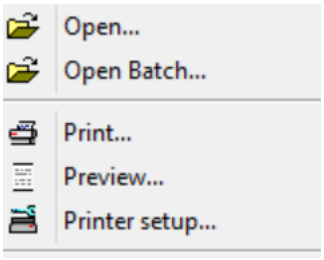


Figure 4.1. Print

Under the drop down menu entry “File” is typically

- ”Print”
- ”Preview”
- ”Printer setup”

Print

Printing of **graphic** charts are a screenshot. What comes on the printer is what is displayed on the monitor. While for **numeric** printouts you have to choose what to print.

Preview

The printout is displayed on the monitor.

Printer setup

Here you can see the Windows default printer settings form.

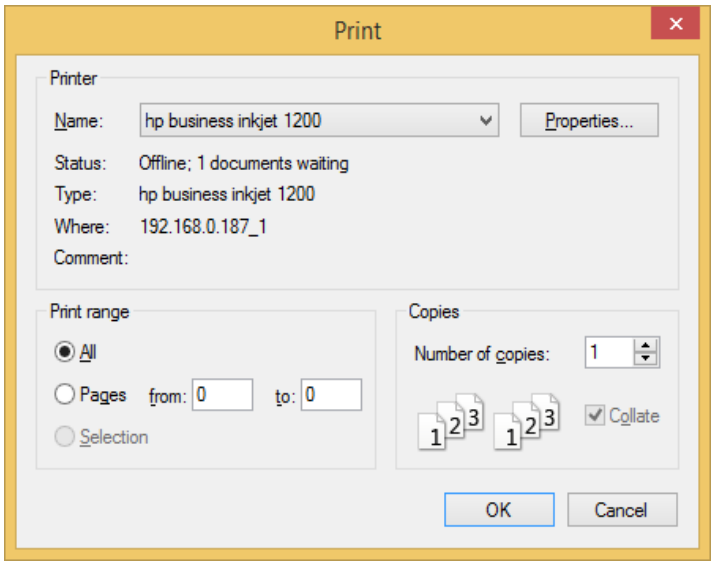


Figure 4.2. Printer setup

4.1.1 Print to PDF-file

Click ”Preview”.

Click the diskette symbol and the picture in figure 4.4 displays.

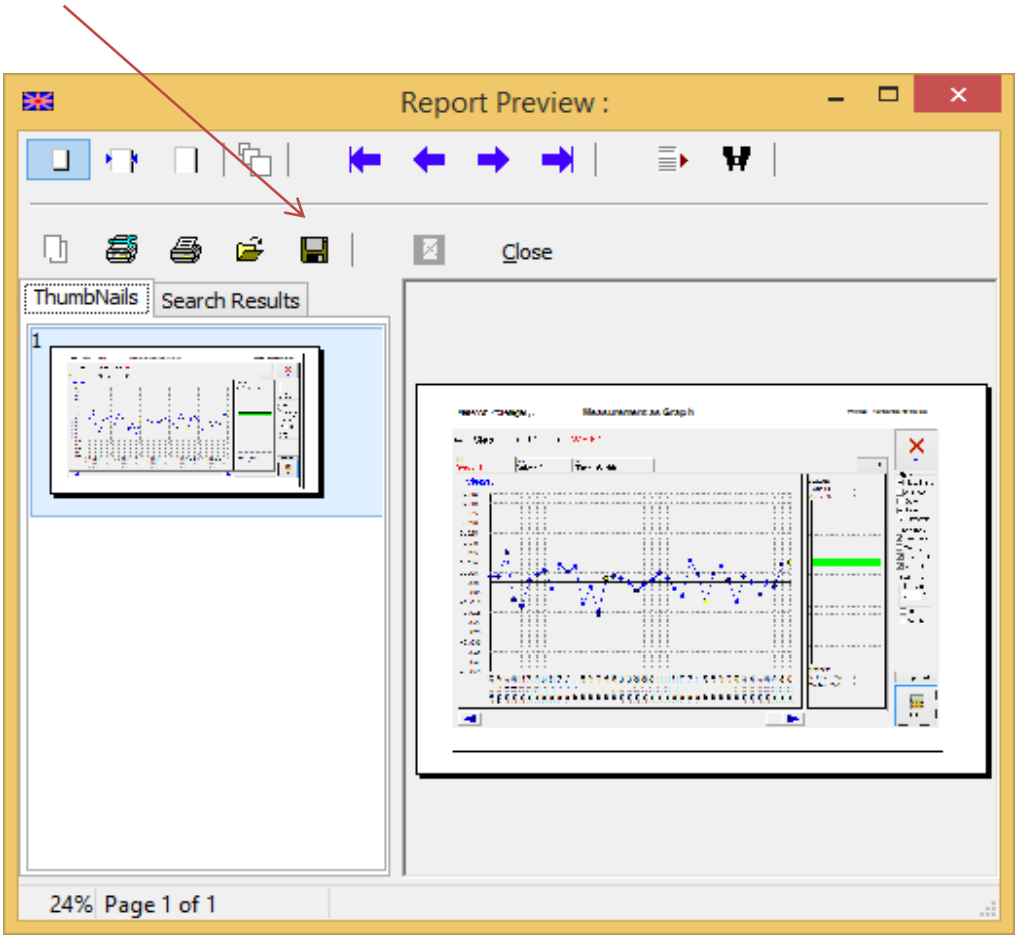


Figure 4.3. Preview

Select pdf-file to receive the printout

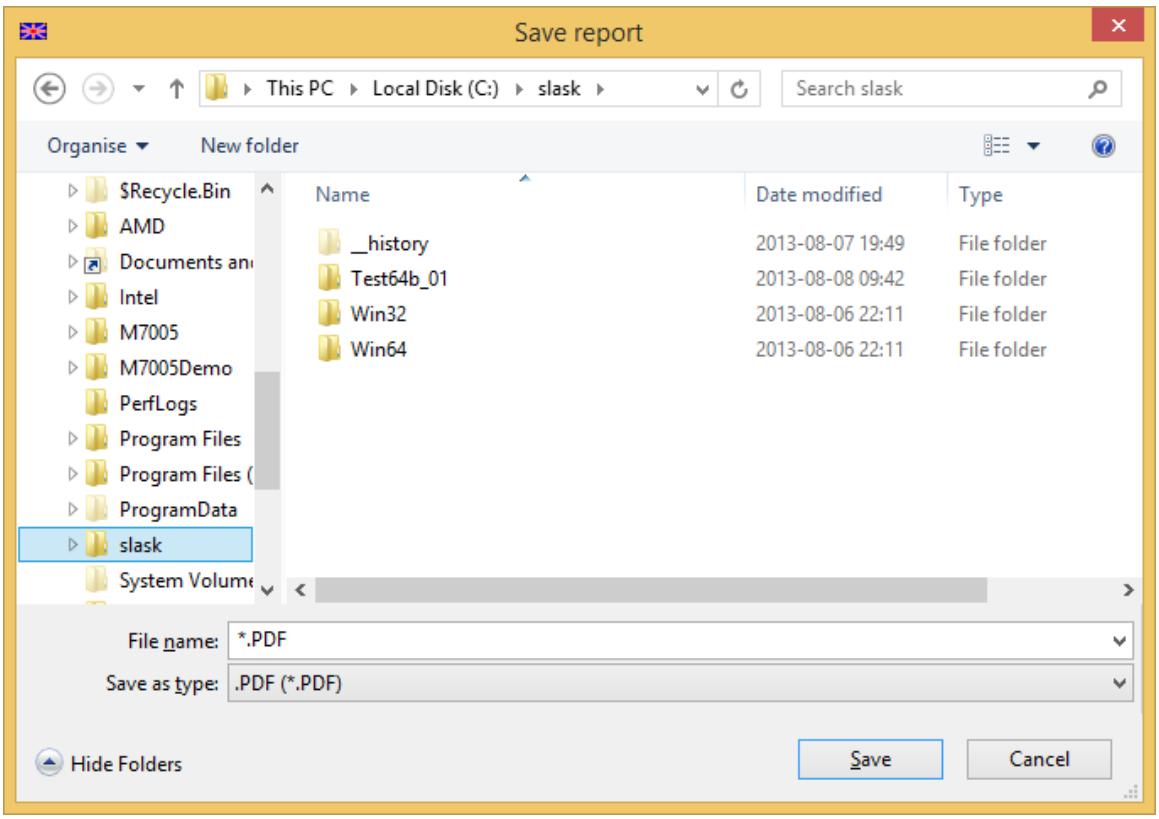


Figure 4.4. Selection of pdf-file for receiving the printing output.

Click "Save" and the printing output is saved in the selected file.

5 Utilities

5.1 System Definitions

The form to give overall information system appears by "Utilities / System Definitions". The forms button can be placed on the Button Panel.

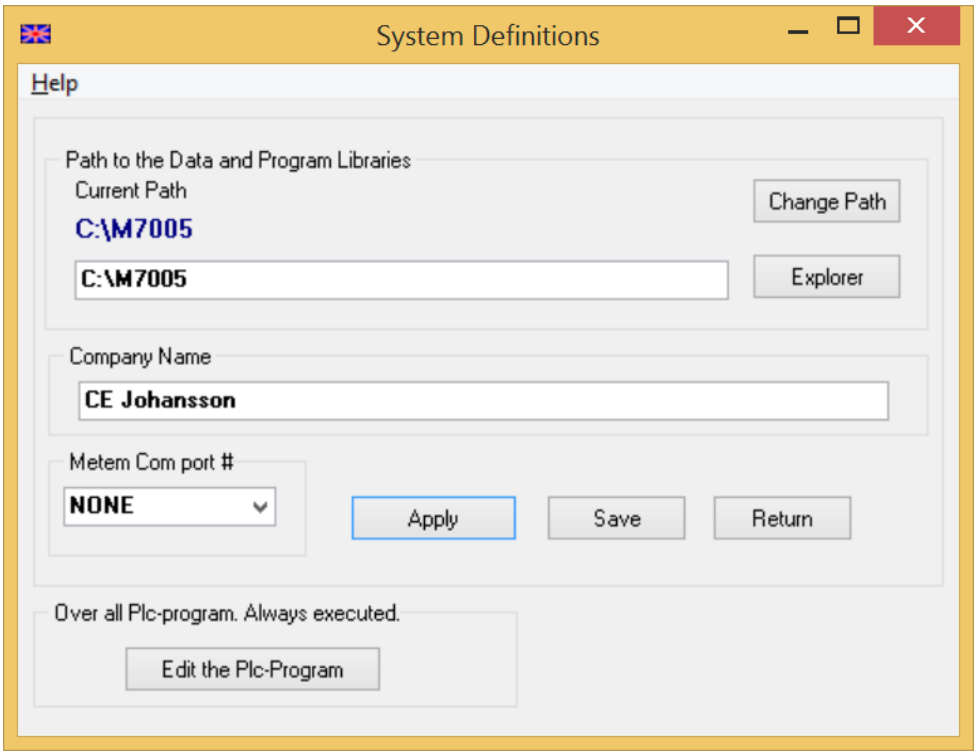


Figure 5.1 The Form to provide for system common data

The path to the Data and Program libraries

The folder (library) containing the ProgramMS and folder Data. ProgramMS contains the measurement programs and the Data folder contains database of measured values. If you want to change the path, you can enter the full path to the new folder in the edit box or go by Windows Explorer.
To get the changes in use, the entire measurement system has to be restarted.

Company Name

The company name you enter here is included in the output from the system and if no special company logotype is available in the library SysParamLib, the company name is printed in the top left corner of the "Measurement display picture".

Company Logotype

If there is a logotype stored as a bitmap in a file named CompanyLogo.bmp.The logotype will appears at the top left of the "Measurement display picture". CompanyLogo.bmp must be in the SysParamLib folder which is a subfolder of the folder that contains M7005 .exe

Metem com port

If Metem 9000 units are used (The system is a M7005**m** system), here you give the name of the com port (COM1 - COM4) to connect to Metem 9002, 9003.

The buttons “Apply”, “Save” and “Return”

”Apply” checks path is ok, replace the company name, restart communication with the hardware and restart any external servers.
”Save” first carry out the same task as "Apply" and then save the given values in the parameter file. The saved values will then be used until you make another change.
”Return” close the form.

Over all Plc-program. Always executed

By clicking on the button "Edit the Plc program" the form for editing the Plc program shows up. This PLC-program runs independently of witch measurement program is executed. If the active measurement also has a plc-program, will both plc-programs run one after another. You have to be extra careful so the tow do not interfere with each other in an inappropriate way.

5.2 Measurement Program started by H25 – H32

The form in Figure 5.2 below displays by "Utilities/ Meas.Prog. started by H25-H32".

The form also has a button

that you can lay out on the Button Panel.

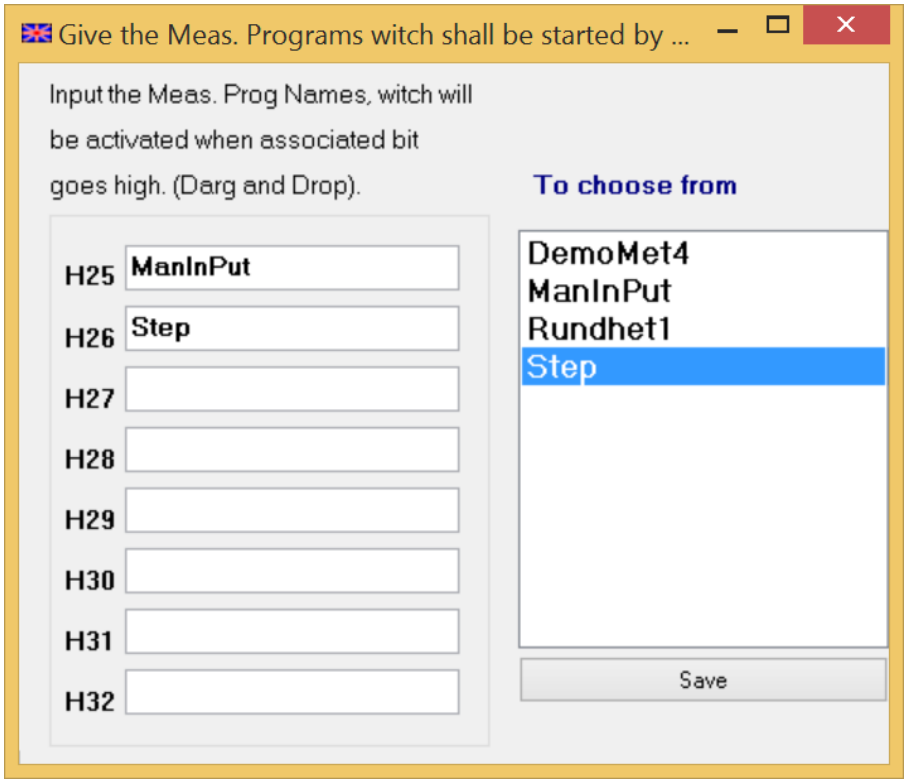


Figure 5.2. Form to connect measurement programs to H25-H32 bits

Give the Meas. Programs which shall be started by H25 – H32

The measurement program at each bit will start when the bit goes high.

As the form says, you just have to drag and drop a measurement program to the H-bit. If you want to remove a measurement program from an H-bit jus clears the input area.

5.3 Specify Transducers

See section 3.9.1

5.4 Give temporary license key

Enter the 7 digit key on the form (see Figure 5.3) and click on "Save". M7005 will run in 14 days from the date that the license key was created without the sign "License key is missing" comes up.

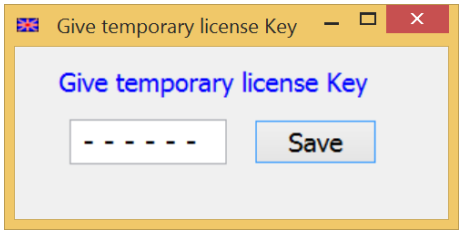


Figure 5.3. Form to provide temporary license key.

5.5 IBR

M7005 is available in two editions, with or without built-in support for communicating with IBR's transducer devices, io devices and foot pedal.
Click on "Utilities /IBR" to show the form in figure 5.4 .
In the form you specify from/to M7005 transducers (Txx), io-bits (Ixx, IQxx) who shall receive/send data from/to the IBR units.
For more information, see the manual "M7005 and IBR" which can be downloaded from M7005 's website.

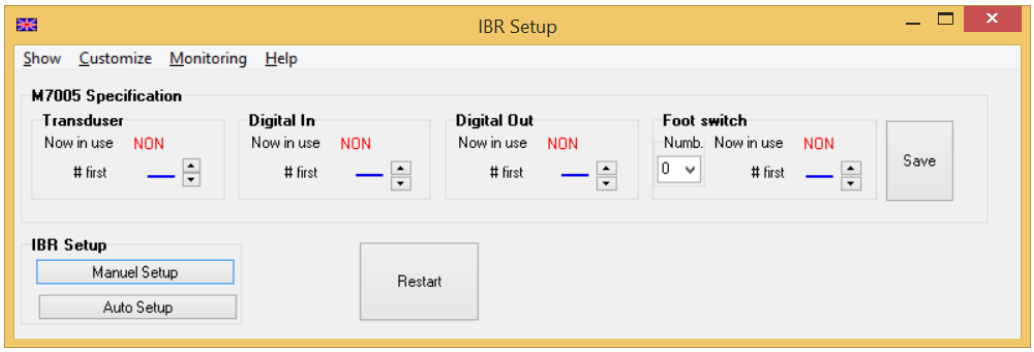


Figure 5.4. Form to configure data transfer from/to the IBR modules

6 Applications

6.1 Scan in dimensions

For more detailed information, see the manual: **Straightness and Scanning with M7005**.
The manual can be downloaded from www.M7005.metem.se.

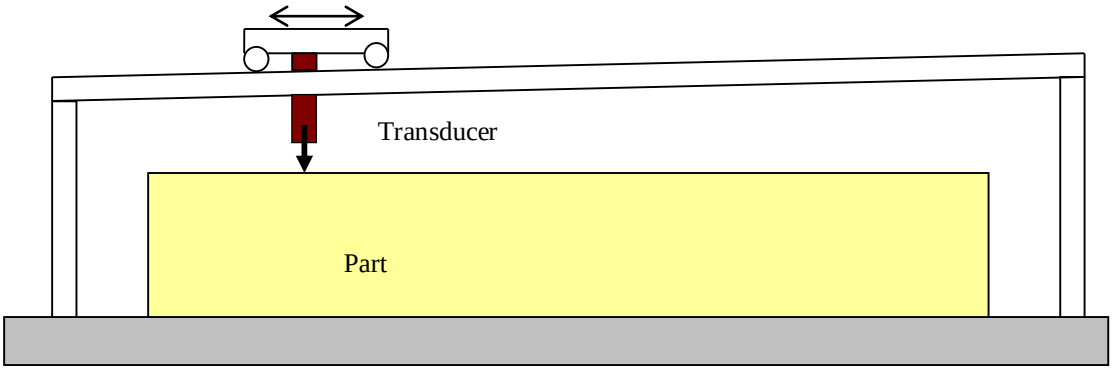


Figure 6.1. Measurement of straightness

We want to measure the straightness of the part in Figure 6.1. In the example transducer moves straight but not parallel to the part.

We choose "Scan Meas." from Jz3000x:s drop down menu "Applications". The image in Figure 6.2 shows how a blank "scan in chart" looks.

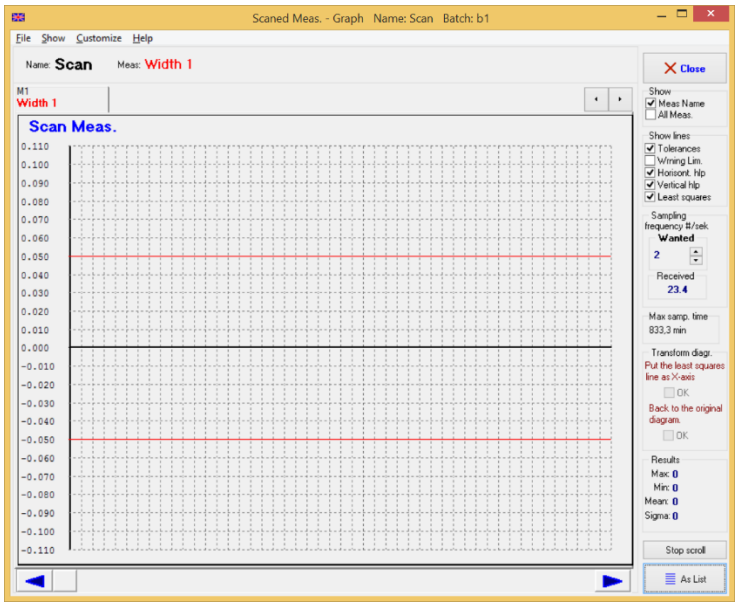
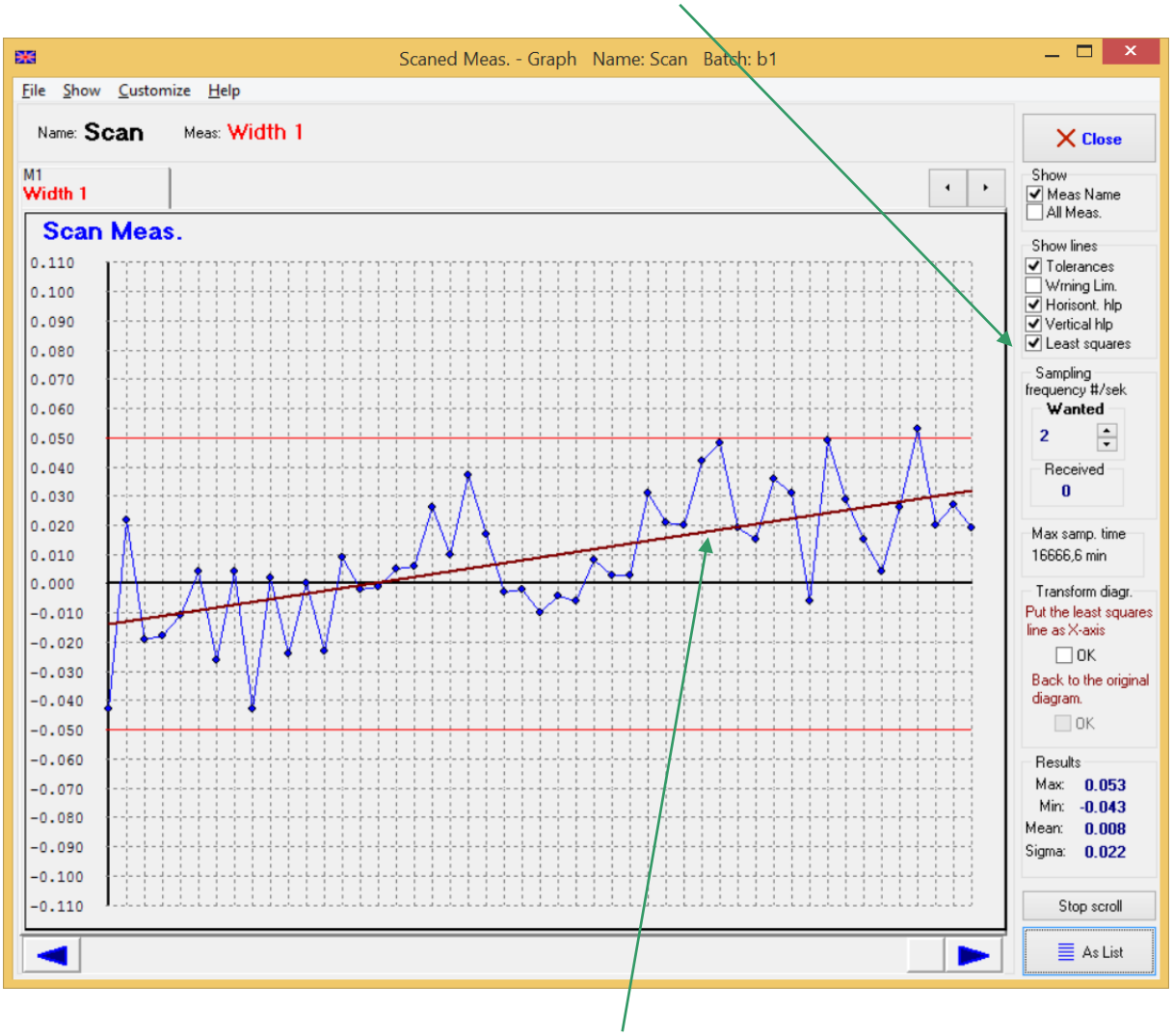


Figure 6.2 Scanning.

We put the measurement transducer in its starting position and give the measurement order at the same time the measurement transducer start to move towards its end position. When the measurement transducer reached its end position the measuring order goes low.
The result is shown in Figure 6.3.

A line calculated by least square method is shown, if the box is checked

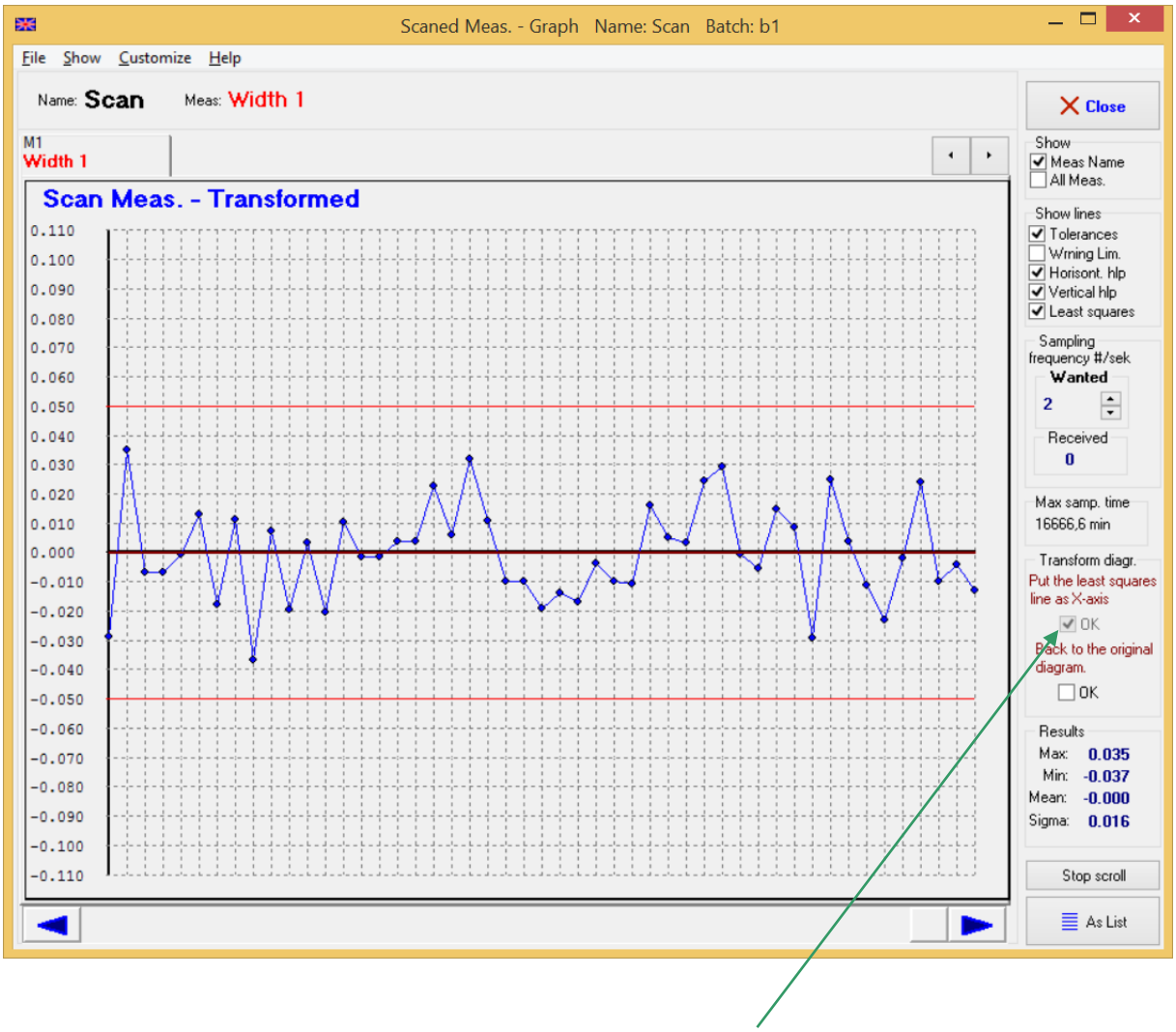


Calculated using the least squares fit line

Figure 6.3. The result of the Scanning

The estimated straightness is Max – Min is 0.053 – (-0.043) = 0.096. But then the transducer was not parallel to the Part. The result contains a measurement error. To reduce error, you ask the program to calculate an average line based on the measurement values, and then recalculate the measurement values from this line. The average line location is calculated using the least squares method.

When you click the box "Out the least square line X axis" makes the program conversion and the results are presented here in Figure 6.4.



Box to do the conversion

Figure 6.4. Scanning recalculated so mean squares line is equal to the X axis.

We now see that the estimated straightness, (Max-Min) has become 0.035 – (-0.037) = 0.071 which is closer to the truth than the previous value.

Note. The true straightness can be slightly smaller then the straightness is defined as the smallest distance between two parallel lines in which contains all measurement values.

6.2 Roundness measurement

For more information se the manual : **M7005 – Roundness measurement**.
The manual can be downloaded from www.M7005.metem.se

The program will measure the radius of a rotating detail during a lap. The result is presented graphically, as shown in Figure 6.5. The underlying measurement values are displayed as a list, see Figure 6.6.

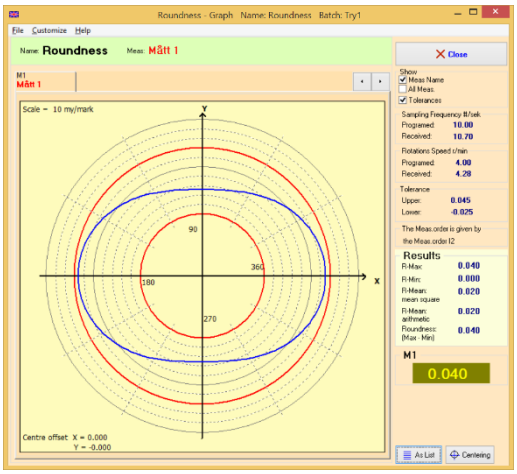


Figure 6.5 The result as a chart.

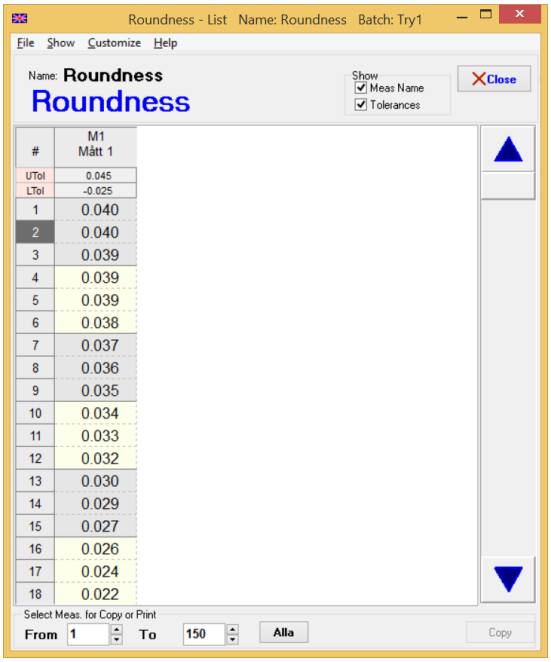


Figure 6.6. The result as a list.

Two examples are used throughout this manual.

Two examples

Ring

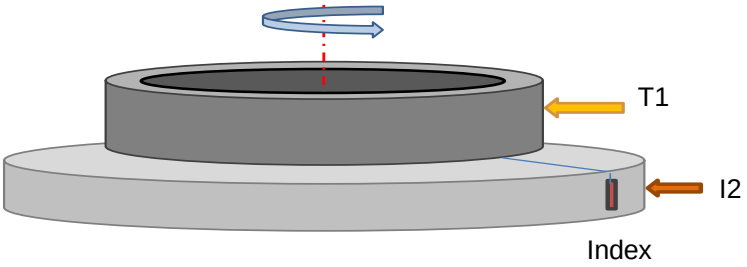


Figure 6.7. Roundness measurement of a ring

We measure a ring that is posted on a table that rotates. On the table is an index mark and a sensor (I2) that provides a pulse when the index mark is passed. By allowing measurement order to be high between two index passages, we receive readings during a lap. The ring must be positioned so that T1 is working within its working range throughout the revolution, but the ring's center and the table's center need not match. The program is able to correct for a smaller difference.

Note: However if the table center throws, the roll will be accounted as a roundness error.

Shaft

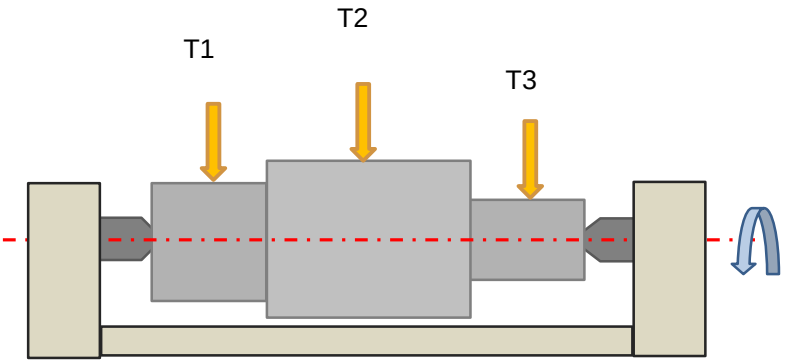


Figure 6.8. Roundness of a shaft.

In contrast to the Ring-example we here have no index mark to start and finish the measuring cycle,
So we must let the program, based on the rotation speed, calculate how long a lap last. The program begins to take in readings when we click the "run" button in the graphic image and continues until the estimated time needed to rotate one revolution has past.

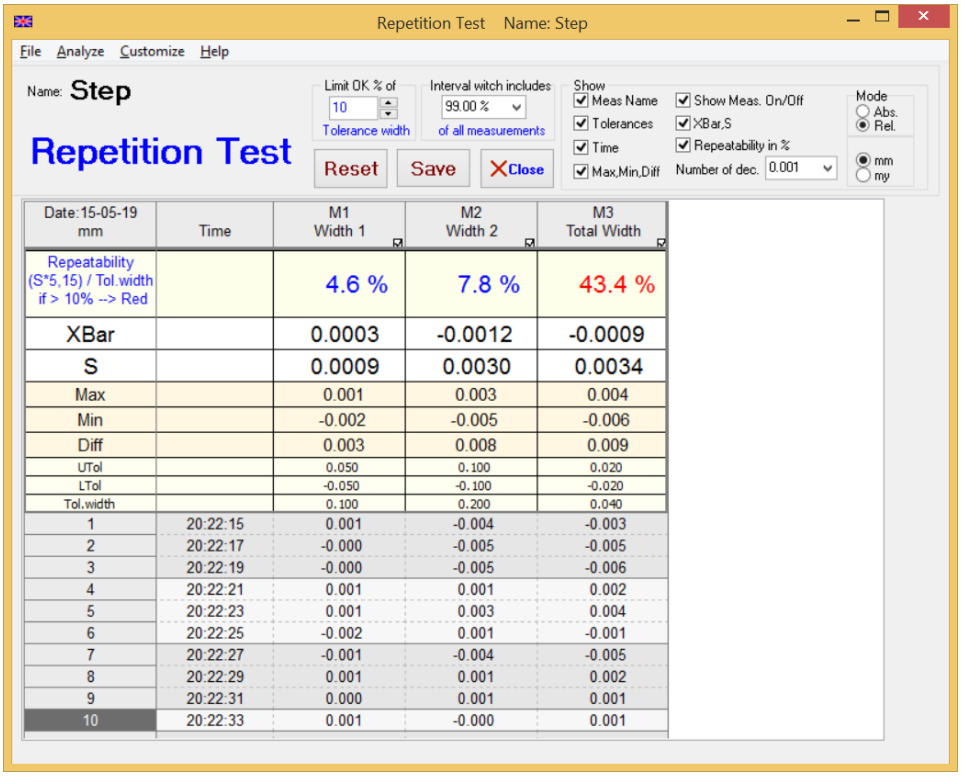
6.3 Repeatability test, MSA

For more information see the Manual: **M7005 – repeatability test, MSA**.
The manual can be downloaded from www.M7005.metem.se

This repeatability test is primarily intended to control a automat loaded fixture and we do the measure on the same part (master, if available) and the measurement is done at the same measurement points.
We also assume that the measurement error is normal distributed with mean μ and the deviation σ.

A measuring system functionality is normally tested by the methods described in Measurement System Analysis (MSA) published by a working group consisting of the Chrysler/GM ….. Three operators are measuring 10 parts three times (a total of 90 measurements) and the result is presented in a table. A simplified variant, consisting of two operators that measure 10 parts twice, is also common.

If the test is carried out in a automat loaded fixture (the part is entered in measuring position by the fixture) and measurement results are automatically registered, there is no influence from a operator on the measurement results. If you also use the same detail and the same measuring point, the part influence on the equipment is minimized. To further reduce the impact of the part, its surface should be smooth. Using the master as the detail can be recommended.
Under these conditions, the variations in the measuring values arise from the measurement system.



Date:15-05-19 mm	Time	M1 Width 1	M2 Width 2	M3 Total Width
Repeatability (S*5,15) / Tol.width if > 10% --> Red		4.6 %	7.8 %	43.4 %
XBar		0.0003	-0.0012	-0.0009
S		0.0009	0.0030	0.0034
Max		0.001	0.003	0.004
Min		-0.002	-0.005	-0.006
Diff		0.003	0.008	0.009
UTol		0.050	0.100	0.020
LTol		-0.050	-0.100	-0.020
Tol.width		0.100	0.200	0.040
1	20:22:15	0.001	-0.004	-0.003
2	20:22:17	-0.000	-0.005	-0.005
3	20:22:19	-0.000	-0.005	-0.006
4	20:22:21	0.001	0.001	0.002
5	20:22:23	0.001	0.003	0.004
6	20:22:25	-0.002	0.001	-0.001
7	20:22:27	-0.001	-0.004	-0.005
8	20:22:29	0.001	0.001	0.002
9	20:22:31	0.000	0.001	0.001
10	20:22:33	0.001	-0.000	0.001

Figure 6.8.The repeatability test

7 Define Measurement Programs

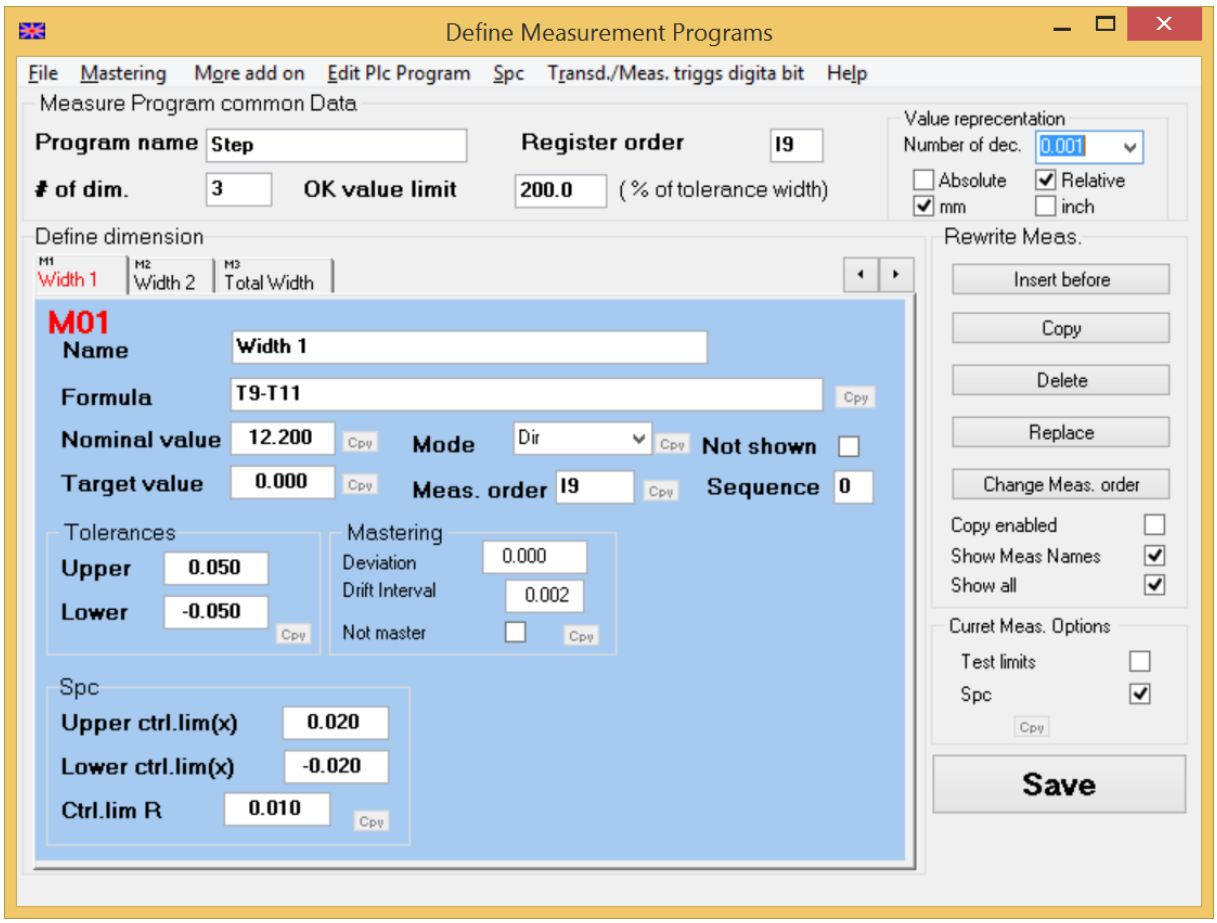


Figure 7.1Define Measurement Program

Input form has a menu bar that contains. ”File”, ”Mastering”, ”More add on”,” Edit Plc-program” and ”Help”. For standard version ”Spc” and ”Transd./Meas. Trigs digital bit” and “Meas steer”.

The form is divided into four fields.
”Measure Program common Data”, ”Rewrite Meas.”, ”Define Dimension”, ”Current Meas. Options” and ”Save”

Measurement, Dimension

Measurer and dimension are in this document used alternating and denotes a quantity (usually, but not always, a distance) defined on a detail drawing.

Measurement value

The measurement value is the numeric value we obtain when we measure a special part.

7.1 Save

You have to Save to apply the changes.

7.2 Measurement Program common Data

Program name

The name of the measurement program. This name is also used to name xml file and data library in Windows and must not contain for Windows illegal characters.

Number of dimensions

The number of dimensions in the measurement program.

Register order

The input, digital bit, when it goes low cause the measurement values to be stored in the database. Allowed values are I1 tom I40 and H1 tom H 48. H33 - H48 have fixed meanings.

OK value limit

Warning limit for unreasonable big value in % of tolerance with. Is a value bigger than the limit, a warning sign coms up and the operator can choose whether the measured value shall be kept or not.

Number decimals

Number of decimals used in this measurement program.

Absolute – Relative

The dimensions will be shown as absolute (real dimensions) or relative (deviation from nominal dimensions). The relationships between these are
Absolut value = deviation from nominal value + nominal value.

Usually, you can switch between the different modes without any worries, however, this does not goes for dimension that has other dimensions in the measure formula. Measurement programs with such dimensions is set to absolute by default. An example are available in the Measure formula below.

mm - inch

Select the unit to be displayed in the charts. What is selected has no impact on the measurement values.

7.2.1 The Menu Bar

In order to obtain a measurement program with the characteristics you want, you have to go through the options in the forms menu bar.

Mastering

Mastering has a form shown in Figure 7.2.

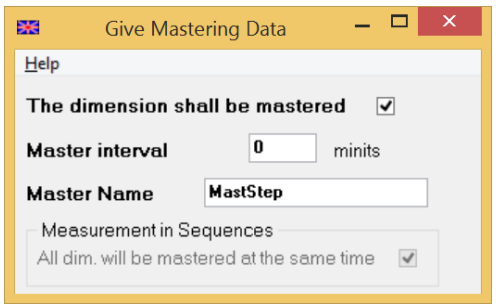


Figure 7.2. Form to enter mastering data

The dimension shall be mastered

Uncheck the box if no measurement in the measuring program shall be mastered.

Master interval

This field specifies the number of minutes when exceeded demands a mastering is made. When the time expired a sign "Mastering request" shows on the monitor. If the sign erased it will pop up after 25 seconds. The only way to stop the sign to pops up is to master.
NOTE: Time is running continually and only set to zero when the mastering is done.

Always mastering at measurement program start

If you want to master every time as the measurement program starts, you can fix it with a Plc program that looks like:

```
H1 = T(H43, 0.5, 0.5) // Half a sec. pulse,
                      // H43 always zero at prog star

H33 = R(H1, S5)       // H33 mastering high, until
                      // S5 mastering request
H43 = 1;
```

Master Name

This field specifies the name that will appear in the sign "Place the master,..... in position".

Measuring program divided in sequences

For measuring program divided into sequences, you can choose if all measurements in all sequences shall be mastered simultaneously or the sequences shall be mastered one by one in raising order. For more information see Manual: M7005 - Measurement Program divided into Sequences.

Add on

Figure 7.3. Add on

In this form has gathered selections that do not fit under any of the other headings.

Max number of showed Meas. Bars

How many dimensions bars in the "Dimension Display" form which can be viewed at the same time.

Give Part ID

You can decide when the form ”Give Part ID” will be shown. The possibility’s except ”Never” is ”Before Measurement Order” that means when the measurement order goes high.
”After registration order”. The form pop up when the registration order goes low.

You can bring the form for giving a part Id by clicking “Tools / Give Part ID”.

Show current Sequence in separate window

Is this option selected, in addition to the standard display, the current sequence shows up in a separate form.

Give Sequence Caption

If you click on "Give Sequence Caption" a form pops up in which you can give the text that appears at the top of the window. Max 10 headlines.

No automatic change of sequence, when all its Meas. Are measured

Normally, the program automatically changes to the next sequence in turn then all current sequences dimensions are measured. If you don’t want it to happened, you check the square here. The change of sequence may then be carried out in the measuring programs plc-program by enable H36 "Jumps to the next sequence".

7.2.2 Edit Plc Program

See section 8 below.

7.2.3 Spc – Statistics Process Control

Figure 7.4 Form to define Spc data

Number of Meas in Spc. group

Measurements following each other bundled together into one group. How many values that every group is made up of is given here. Group average (XBar) and its spread is displayed in

chart XBarR-diagram.

Number of groups in Cp/Cpk, Pp/Ppk reg

Here you specify how many groups a Cp/Pp group will contain.
The difference between Cp/Cpk and Pp/Ppk is that Cp/Cpk using the average R of the groups belonging to the current Cp/Cpk as deviation value, while Pp/Ppk uses the standard deviation for all the measurement values making up the Pp/Ppk group.

Automatic display of last group

If you choose this, the "Last group" form is automatically displayed when the group becomes full.

7.2.4 Define Measurement or Transducer who can set/reset Plc bit

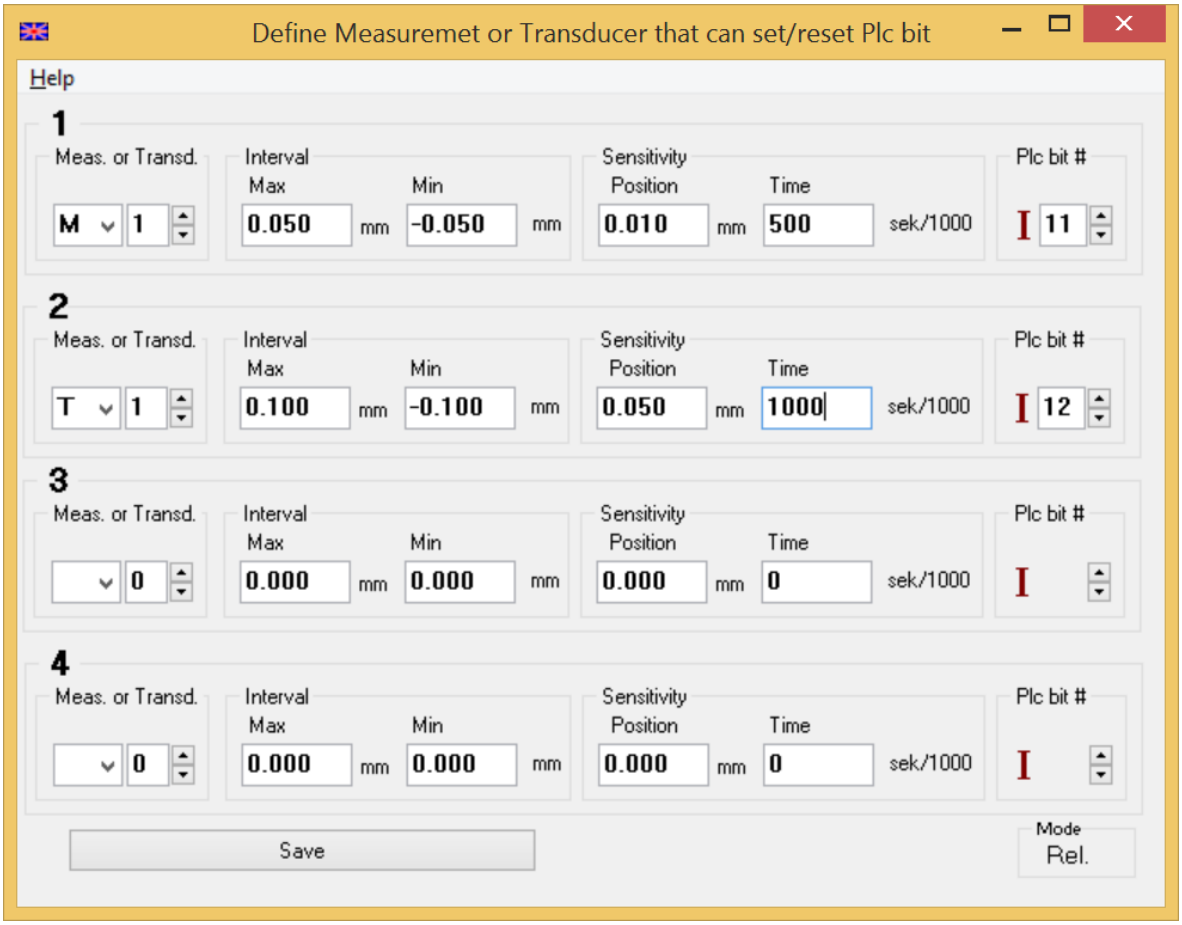


Figure 7.5. Define dimension or transducer that can set/reset Plc-bi, Ixx – bit.

You can specify the conditions that must be met for a measurement or transducer value to affect the desired Plc bit Ixx.

Suppose we want to Measure 3 shall affect the input signal I11, then we will give

Interval: The measurement values has to be within this values for sensitivity tests to be done. We put Max = 0.05 and Min =-0.05.

Sensitivity: If the measured value is within the range set above, the value will be tested for stability. That is, if there is no change of position more than specified in the "Position" and has to be so longer than the time specified in “Time”, the selected bit set = 1. Suppose we set Position = 0.01 and time = 500.

Plc bit #: When the above conditions are satisfied, the Ixx bit sets true (= 1) but as soon the conditions isn’t met, bit sets false (= 0).

With values as described above, then I11 will be true if M3 's measured value is within ± 0.05 mm of nominal value and does not have changed more than 0,01 mm the last half a second.

Note:
Instead of a measure, you can choose a sensor T1 tom T80.

Note:
The dimensions you can select is M1 to the last dimension in the measurement program. If the system is in Relative mode the intervals are deviation from nominal value. In Absolute mode the range is given in absolute terms.

An Example:
Suppose we want to measure the diameter of a 50 mm axle with a caliper. We want to get the automatic measurement and registration when the measurement is made. Suppose further that the caliper measured value comes in as T1. We indicate therefore in the form Max = 50.1, Min = 49.9, Position = 0.05 and time = 500 and Plc bit = I10;

If we in our measurement programs have a Plc program with a line that H2 = T (I10, 0.1, 0.3), H2 becomes true 0.1 second after the I10 comes true and that in 0.3 seconds. We sets the measurement order and the registration order = H2 in the measurement program. Now we will get an automatic measurement and registration when the caliper value has been still for at least half a second in the range 50(1) – 49.9.

7.3 Define dimension

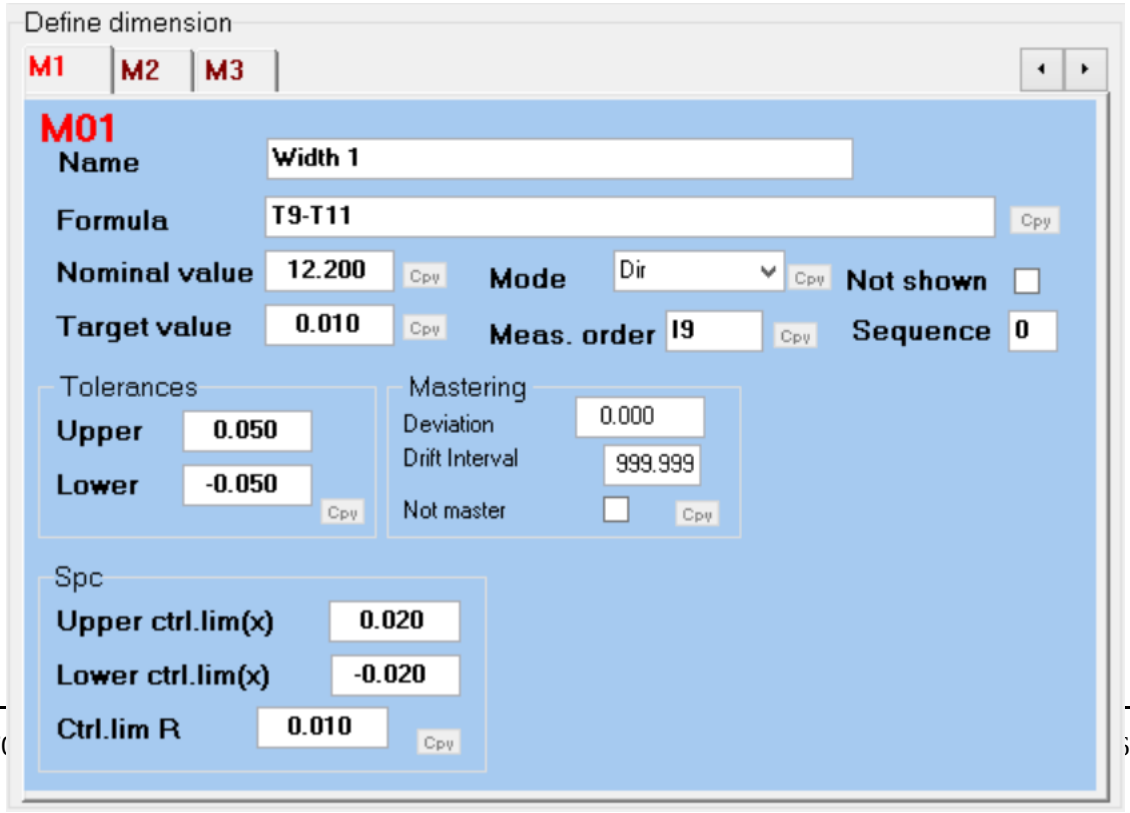


Figure 7.6. Form to define the measurement programs dimensions.

Name

The name of the measure consisting of max 79 alphanumeric characters.

Formula

The measurement formula is the formula used to calculate the measurement's value. The measurement formula is calculated continuously as long as the measurement order is high. If the field completely blank, M7005 never update the measure, someone else has to do it such as a General (_ G) server.

A Formula consists of

Allowed operators

+, -, /, *,), (,

For instants. T1/2 + T2*3.14 + 2*((T5 + T6)/2 – T7)

Allowed operands

transducer number T1-T80 and constants , Dimension (measurement) Mxx where xx is 1 through the measurement programs highest measurement number.

Mathematical functions

ABS absolute for instants ABS(T1 + ABS(T2))
COS cosine for instants COS(M2)
SIN sine
TAN tan
SQRT square root

Build in function

S = mean square sum ex: S(M1, M2) = SQRT(M1*M1 + M2*M2)
B = biggest ex: B(M1, M2, M3, M4) return the biggest value of M1-M4
L = lowest ex: L(T1, T2, M4) returns the smallest value of T1, T2 and M4
D = B-L ex: D(M1, M2, M3, M4) return the biggest difference of M1 - M4

Note: Measurement formulas to be mastered may not contain second order terms of other variables other than dimensions (Mxx).

Note: Measurement programs with one or more dimensions that has a formula that contain dimensions. For example, the formula = M3-M5 + (T1 + T7) must be in Absolute mode. If not M7005 automatically switches over to Absolute mode.
An example of why Absolute mode is necessary. Suppose we want to calculate the area of a square. We give M1 measure formula = T1 and nominal dimensions 10 mm. We get the area (M2) with the formula M2 = M1 * M1 with nominal value = 100.
Suppose further that M1 has the value 10.03. In absolute mod M2 will then be = 10.03 * 10.03 = 100.601 while in relative mode M2 becomes = 0.03 * 0.03 = 0.001. Which is not correct.

Nominal value

Internal M7005 work with the deviations from the nominal values. Absolute (real) measured

value = nominal value + measured deviation from nominal value.

Mode

The measurement values are calculated continuously as long as the measurement order is high. Mode define type of received value.

Dir = the momenta value of evaluation of the formula.
Max = the maximum value received as long as the measurement order was high
Min = the smallest value received as long as the measurement order was high.
Max – Min
(Max + Min)/2
Mean Value = the usual average = the sum of all the measured values as long as the measurement order is high, divided by the number of captured values.
Man.Input = Values is given by the form "Tools / Give Measurements" .
Roundness = se manual : **M7005 – Measuring Roundness**.
The manual can be downloaded form www.M7005.metem.se.

For programs with "Man.Input" dimensions the following rule applies. If there is a non-manual measure in measurement program, all the manual measurements gets the same measurement order as the non-manual measurement. Consists program only of manual-measurement, all measurements gets the same measurement order as the programs register order.

Not shown

Is a measure marked as not shown has it no bar in "Dimension Display" form. Everything else are not affected.

Target value

The "best" measurement, often the middle of the tolerance interval. For SPS, it is the value we try to produce.

Meas.Order

The input (digital bit) which, when it is high causes the measure to be calculated. Allowed values are I1 tom I40 and H1 tom H 48. Note the H33 - H48 have fixed meanings.

Sequence

There are times that you want to measure a part in several steps, for example, first in a fixture then in another fixture or measuring a number of measures with hand measuring devices. In order for this to be possible, you can divide the measurement program in to sequences.
Measurements with the same sequence number are measured at the same time.
The sequence of numbers begins at 1 and all the numbers up to and including the highest sequence number must be present.

Dimensions with sequence number = 0 are always measured when its measurement order is high. A measurement program not divided into sequences, must have all its measurements sequences set to zero (0).

When measurement order goes low, the measurement program automatically jumps to the next sequence. It doesn't goes for measurement programs which has checked "No automatic change of sequence, when all its Meas. Are measured" se figure 7.1.

.

With help of the digital bits H35, H36 and H37 you can change the sequence.
When H35 becomes high the measurement program jumps to sequence 1.
When H36 becomes high the measurement program jumps to the next sequence.
When H37 becomes high the measurement program jumps to the previous sequence.

For more information se the manual "M7005 – Measurement Program divided into Sequences"
.

Tolerances

Upper and lower tolerance for the measure. If the measured value is outside the tolerance, it is marked in the result displaying forms with different color, the results flags S1 (over tolerance) or S4 (under tolerance) is also changed.

.

Test limits

As for tolerances but now the result flags S2 (over the test limit) and S3 (under the test limit) are affected. If both Upper and Lower limit are = 0, the limit test is disabled..

Scroll increment (only for Mode = Man.input)

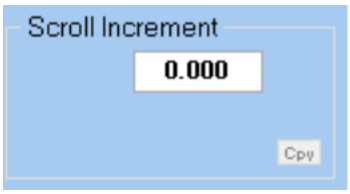


Figure 7.7.

For measures that gets there values from the form "Manual Input" You can here define how much the value should change with each press of the up/down button.

Mastering

A measured value = the result of measurement formula + zero difference where zero difference = the deviation from the nominal dimensions minus the result of measurement formula then the master was “measured “ i.e. when mastered. Contains the formula measures (M2 = M4 + T2) do the measurement (M4) not contribute to the zero difference.

Deviation

Deviation = masters deviation from nominal value.

Drift interval

If the zero difference for the last mastering minus zero difference at previous mastering is greater than the drift interval, you receive the error message in figure 7.8 and S7 (mastering error) goes = 1

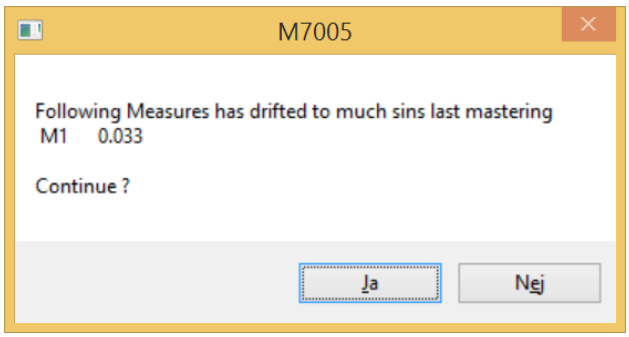


Figure 7.8. Error message if the mastering drift has been too large between two masterings.

Reply to "No" will cancel mastering and the old values apply. S7 = 1 remains until the next mastering starts. Responding "Yes" the mastering is carried out as usual and S7 goes = 0.

No Master

For dimensions that should not be mastered, the master deviation is put to = 0 as well as the zero difference = 0. The measured value is thus the value dimensions formula gives straight off.

SPC

You define upper respective lower control limits to group mean (XBar). Is group mean over the upper limit the results flag S9 sets = 1 and if the group mean is below the lower control limit the result flagS10 sets = 1. If the group deviation (R) is larger than the control limit for R, the results flag S11 goes = 1.

7.4 Rewrite Meas.

The Edit Buttons

XX = number of the measures which you are currently working with.

Insert before Mxx

A new empty dimension is created before Mxx.

Copy Mxx

A Copy of the dimension xx is taken to use with Replace.

Delete Mxx

The dimension Mxx is deleted.

Replace Mxx

Measure xx is replaced with what we've got when we previously did Copy Myy. That is, the dimension xx replaced with the dimension yy. Dimention yy are not affected.

Change Meas. order

Click on the button, the form in Figure 7.9 shows up

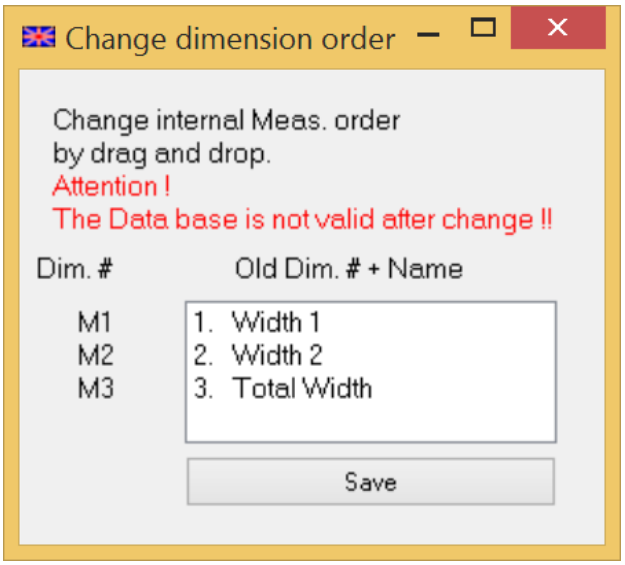


Figure 7.9. Form to move dimensions in the measurement program.

As the picture says you can move a dimension by using the right mouse button and drag and drop the dimension.

Copy enabled

If "Copy enabled" in the "Rewrite Meas." is selected, the CPY keys is active and works as: the values that belong to CPY button copied over to all measurements after the current measure. For example, suppose that measure 4 (M4) is active and its target value = 10.3. If you then click the target values CPY-button, measure 5, 6, 7.. target values sets = 10.3.

Show Meas. Name

Depending on desire and space you can choose if name along with its number or just measurements number shall appear.

Show all

You can also choose if you want to see all dimensional tabs or to scroll the tabs that does not fit to appear.

7.5 Current Meas. Options

Here you determines if the measure should have test limits and/or Spc .

8 Program a PLC program

For more information see manual: “M7005 – Plc programming”.

Warning

How often a Plc program executes, have access to the cpu, depends on

- Windows. Windows is not a real-time operating system that can guarantee response time to a user program.
- What M7005 is doing beside execute the Plc program.
- How fast your computer is, i.e. its CPU, hard drive, etc.

Warning: M7005/Plc does not guarantee any minimum response times, minimum turnaround times or when a specific line in a plc program will be carried out. M7005/Plc is therefore not intended and shall not be used in time-critical real-time applications.

The only way to find out if my application can manage my time requirements is to test.

Note: Dots and circles of åääöÅÖÄ are automatically deleted.

8.1 Write, Modify a Plc-Program

Write, modify, and test is made in the form shown in Figure 8.1 below. The form will be shown by "Define measurement program/ Edit Plc programs" if it is a Plc program tied to a measurement program.
It is a system-wide common Plc-program to be edited, you can reach it via the "Utilities/ System Definitions” and then click on the button "Edit the Plc program".

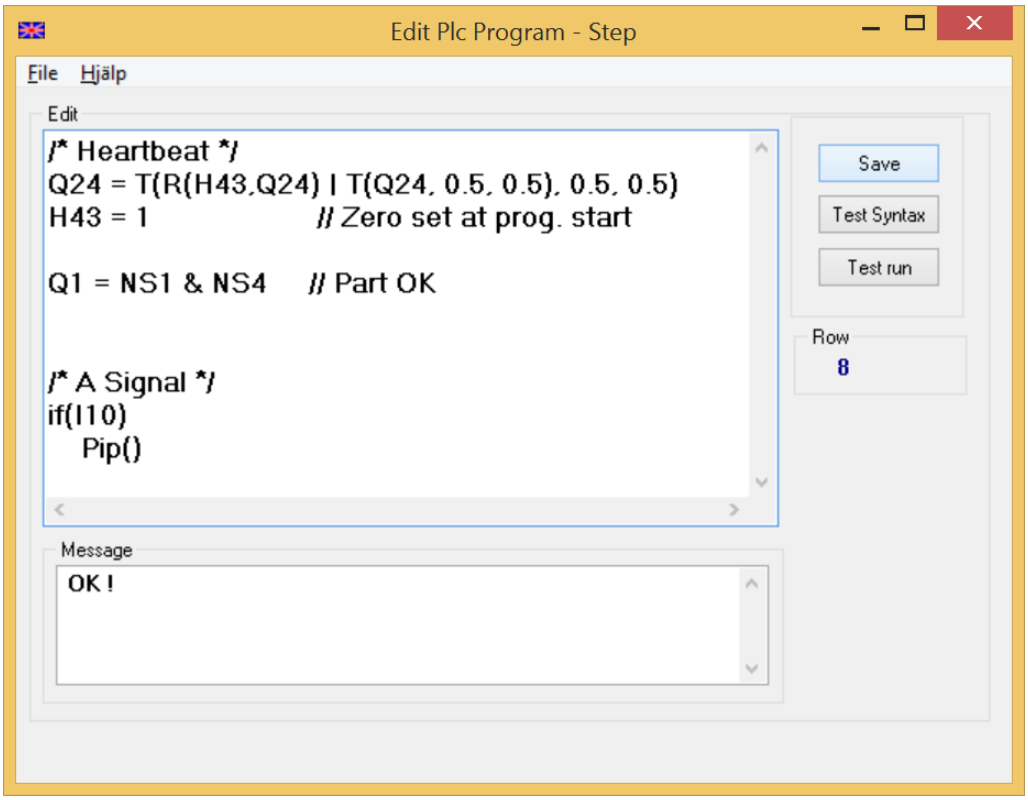


Figure 8.1. The Form to edit and test run plc program.

The form has two panels. In the upper (Edit) you write in/change the Plc program. The panel is a regular text editor so you can cut, paste, insert, tabbing, etc. in the usual way.
In the bottom panel (Message), you can see any programming errors detected. The syntax checking is done when you press any of the buttons "Save", "Test Syntax" or "Test Run". If the program has no errors, "OK !" is written.

8.1.1 The Buttons

Save

The PLC program is stored in the measurement program. **Note:** It the plc program belongs to the executing measuring program, you also have to save the measuring program in the form "Define measurement programs".

Test syntax

Control of Plc program if it is correctly written. That is, if it follows the rules for how a Plc program may be written. **Note**. This does not mean a check if the Plc program is logical correct.

Test run

The edit box is closed for writing at the same time as the "Test run" panel with the buttons "Run", "Step" and "Run to Cursor" appears, see Figure 8.2 below.

8.2 Test

By clicking the button "Test Run" it change the meaning to "Stop Test run" and at the same time "Run", "Step" and "Run to Cursor" appears. When the test run starts, stops the execution of the ordinary active Plc programs. The ordinary Plc program restarts when editing the form is removed. The edit form is removed in the usual way by clicking the X in the upper right corner.

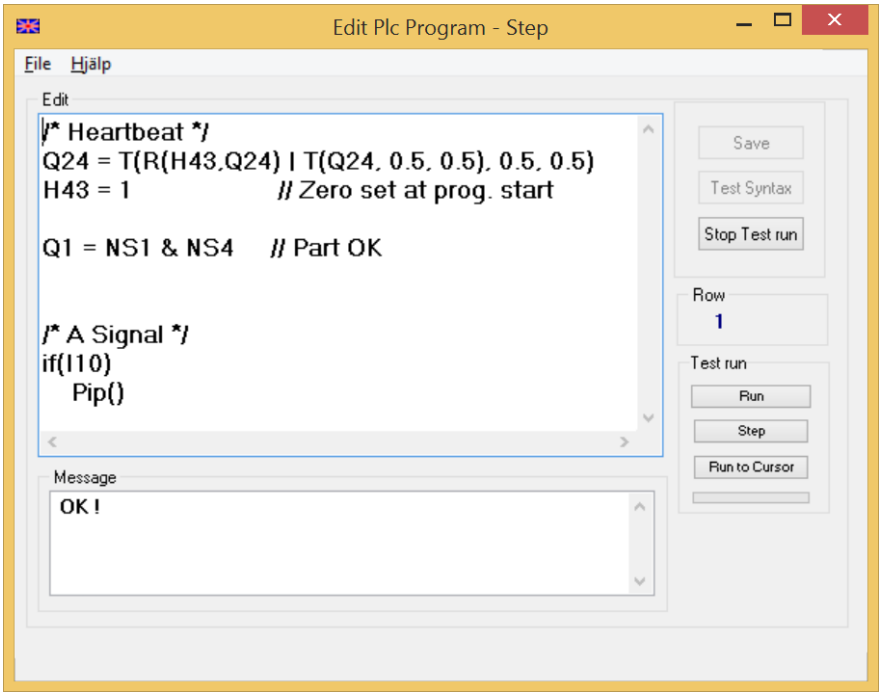


Figure 8.2. Test run

8.2.1 Test run buttons

Run
PLC program runs continuously.

Step
The PLC program is executed one line for each click on "Step".

Run to Curser
Select in the edit box the line you want to run to. Then click on the button "Run to Cursor". The program stops when it come to the selected line. Note If in the example you marks the line with Pip (), the program will stop on that line if/when I10 goes high.

8.3 The drop-down menu

8.3.1 File

Get from .txt File

The Plc programs can be stored in a plain text file.

```
Matematikföretager jz, Sweden, www.metem.se
Plc - Program List  15-06-17 18:24:11
Measurement program: Step

/* Heartbeat */
Q24 = T(R(H43,Q24) | T(Q24, 0.5, 0.5), 0.5, 0.5)
H43 = 1                    // Zero set at prog. start

Q1 = NS1 & NS4     // Part OK


/* A Signal */
if(I10)
   Pip()
```

Example: Printing of Plc applications on file.

Print functions
"Print", "Print setup" and Preview "is the standard Windows features

Modify font
You can change the appearance of text in the two boxes "Edit" and "Message"

9 Specify Transducers – Transducers tests – Mastering tests

In M7005, there are tests on the transducers and measurements are within specified limits

- Transducers are within specified range at measuring.
- Transducers within the specified range at mastering.
- Transducers have not stuck.
- Now made mastering does not differ too much from last made mastering.
- Measurement values are reasonable.

You define the various ranges and if the tests is to be active or not, in the form “Specification Transducers” see section 3.9.1.

9.1 Tests performed as long as the measurement order is high

The condition for the test to be enabled is "H34 Transducer Test On" is high and “Test On” is the picture for "Specify Transducers" is checked.

If the application is divided into sequences, only the transducers in the active sequence take part in the tests.

Test Transducers within its working interval

The control takes place continuously as long as measurement order is high. If any of the Transducers values goes outside the specified limits, an error message pops up, see Figure 9.1, Bitten H40 (System OK) sets = 0 and S6 (Transducer error) sets =1.
H40 sets = 1 and S6 = 0 after the message is accepted.

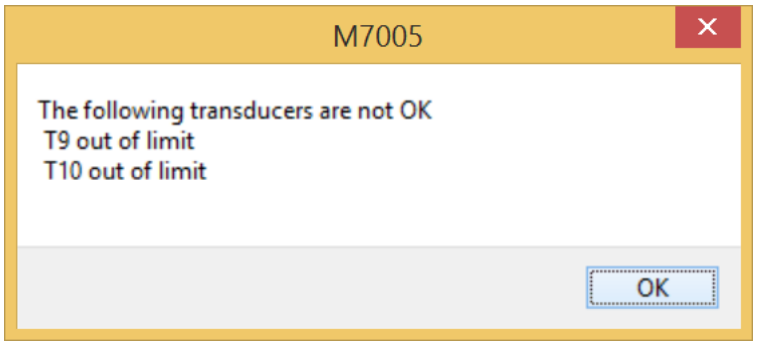


Figure 9.1 Error message from Transducer test

Check that the Transducers are not stuck

The control is active as long as the measuring order is high and the results are valid when the registration order goes low. If there is a sensor that has not moved more than 0.1 mm, an error message pops up. Flag S6 (Transducer error) sets = 1. When the error message is notified S6 sets = 0 again.

Measurement values are reasonable

If any measure is out of (tolerance width * X), where X is given when the measurement program was defied, S8 = 1. S8 stets = 0 when the operator notifies the error message in figure 9.2.

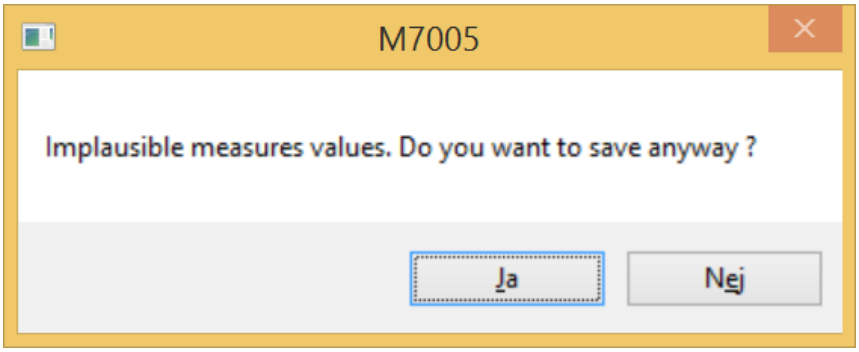


Figure 9.2 One or more measurement values out of range.

9.2 Tester when mastering

Flag S7 (Mastering error) is set always = 0 when the mastering starts.

Check Transducers within working interval

Condition for the transducer testing will be carried out is that ”H34 to Test on" is true and “Test On” is checked in the form "Specify Transducers".

The sensors are tested if they are within the specified mastering interval. If not, a error message pops up and S7 (Mastering error) is set to 1. The range that the sensor must be within is defined in the form "Specify Transducers"

If an operator answering "No" to the question of continuing mastering, the mastering is interrupted and the old master values are kept and S7 is put = 0.
If he replies "Yes" the mastering is carried out as usual and S7 is sets = 0. If the failing transducer isn’t corrected, the error message will pop up again.

Drift

Conditions: Drift test is always performed. If you do not want to be troubled by this, you must give the dimensions sufficient drift interval for example 999,999. The drift interval is define in the dimension define form, see section 7.3.

At the mastering the formula is calculated with the current transducer values. The calculated numerical value is called the zero difference.

The measuring value you get at a measurement = the value given by the measurement formula with current transducer values - zero difference + measured master deviation.

If the zero difference we now get – zero difference we get when we did the latest mastering > drift interval , we have a drift error

An error message pops up, Figure 9.3, and S7 (Mastering error) is set = 1

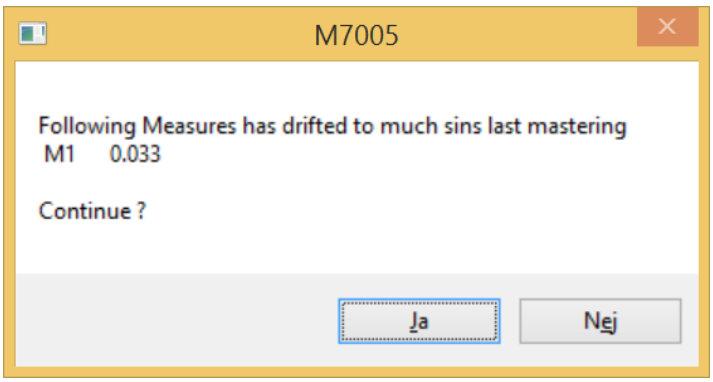


Figure 9.3 error from mastering drift test.

10 Good to know

10.1 Set measurement and registration order by M7005 button

In the system there is a button to give measurement order, and a button to give the registration order. The buttons you can put on the button panel. To add buttons in the Button Panel, see section 2.8.

The measurement order button

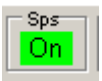
When the gray circle turns green is the measuring order high. The "Button" know itself which Hxx or Ixx, is the measuring order.

The registration order button

When the registration goes high the disk icon color becomes green. Then when the registration order goes low, the registration in the data base taking place. Button knows itself what Hxx or Ixx, is the registration order.

10.2 Temporary disable saving measure values in the data base

If you click on “On” in the “Dimension Display” form



You can temporarily turn on/off the registration of the measurement values in the database. If the square id red “OFF” the measurement values will not be saved when the register order goes low.

10.3 Odds and Ends

10.3.1 ALT/CTRL/Z to move active form to display upper left

Press ALT, CTRL and Z simultaneously to move the current M7005 form to the upper left corner.

M7005 remember where a form were placed the last time it was displayed. If it happens to be on a second monitor and that monitor is not plugged in, use ALT/CTRL/Z.to make the form visible on the screen

Appendix

A. Thought example “Step”

Assume a part shown in figure below. We want to measure three dimensions M1, M2 and M3, and we do so with the help of three transducers T9, T10 and T11

- Width 1 (M1): Has transducer formula = T9 -T11, nominal value = 12.2 mm, and a tolerance of ± 0.02 mm.
- Width 2 (M2): Has transducer formula = T11 + T10, nominal value = 8,6 mm and a tolerance of ± 0.02 mm.
- Total width (M3) : Has transducer formula T9 + T11, nominal value = 20,8 mm and a tolerance of ± 0.02mm.

We create a measurement program named Step.

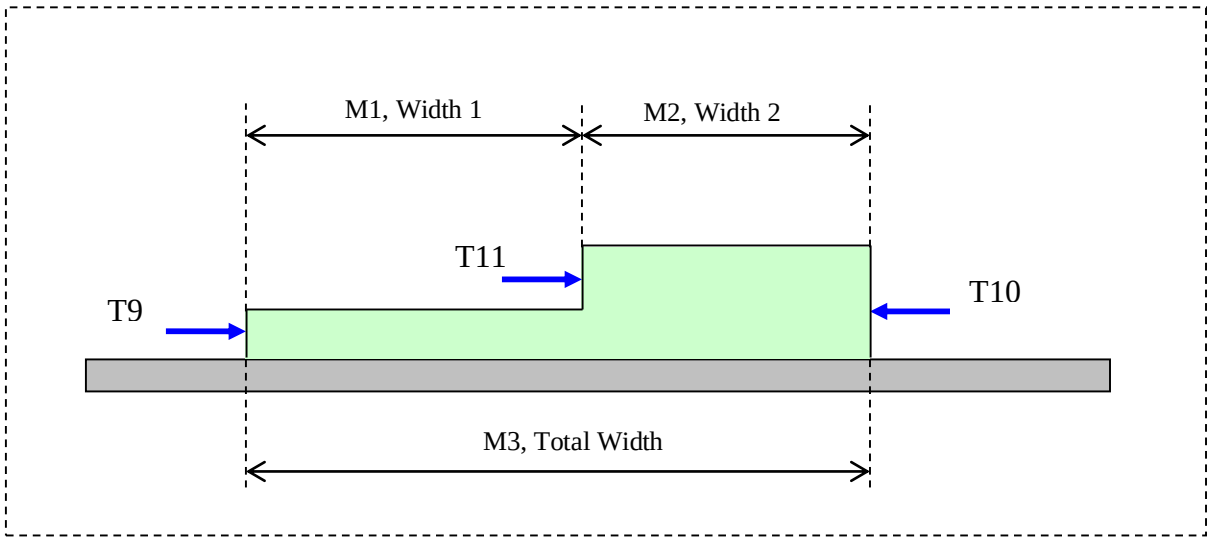


Figure A1. Part measured by the measuring program Step.

```
Program name = Step
Number of dimensions = 3
Register order = I9
Number of meas. in Spc group = 6
Number of groups in Cp/Cpk reg = 3
Impossible value limit = 200.0    ( % of tolerance width)
Give Part ID: Never
Master Name = MastStep
Master interval = 0 min, All dim. will be mastered at the same time
Max Number of shwed Meas.Bars = 2
--- Data out ---
  No
```

```
======= Dim. # 1 =======
Name: Width 1
Formula = T9-T11
Nominal value =   12.200
Target value =    0.010
Mode = Max
Meas. order = I9
Not shown = No
Sequence = 0
---  Tolerances  ---
  Upper =    0.002
  Lower =   -0.002
---  Mastering  ---
  Deviation =    0.000
  Drift Interval =    0.002
---  Test limits  ---
  No
---  Spc  ---
  Upper ctrl.lim(x) =    0.020
  Lower ctrl.lim(x) =   -0.020
---  Data Out  ---
  No

======= Dim. # 2 =======
Name: Width 2
Formula = T11+T10
Nominal value =    8.800
Target value =    0.000
Mode = Dir
Meas. order = I9
Not shown = No
Sequence = 0
---  Tolerances  ---
  Upper =    0.100
  Lower =   -0.100
---  Mastering  ---
  Deviation =    0.000
  Drift Interval =  999.999
---  Test limits  ---
  No
---  Spc  ---
  Upper ctrl.lim(x) =    0.010
  Lower ctrl.lim(x) =   -0.010
---  Data Out  ---
  No

======= Dim. # 3 =======
Name: Total Width
Formula = T9+T10
Nominal value =   20.800
Target value =    0.000
Mode = Dir
Meas. order = I9
Not shown = No
Sequence = 0
---  Tolerances  ---
  Upper =    0.020
```

B. The Digital bits I, Q, H and S function

In bit I1 – I40

I1 – I40 is input signals to the system. What they mean is application dependent, for example, I1 can be attached to a button by some form of hardware. If so, we can use the I1 as the measurement order in our measurement programs. A bit can be set by "Transducers/measurement trigs digital bit"

Out bit Q1 – Q40

Q1-Q40 is the output signals from the system, its significance is application dependent. For example, suppose that we link Q1 to a red light and Q2 to a green by any hardware (IBR, for example) and has the following lines in the measuring programs Plc program

```
Q1 = S1 | S4

Q2 = NS1 & NS4
```

The green lamp will light up if the detail is OK, while the red lamp indicates if any measure is out of tolerance.

Help bit H1 – H24

These bits can be used as you like. Usually they are used as help bits in the measurement programs Plc programs. Below is an example of a Plc program that gives half a second tick tack pulse on Q24.

R is a Set/Reset function and T is a timer.

```
H1 = R(H43,Q24)

H2 = T(Q24,0.5,0.5)

Q24=T(H1|H2,0.5,0.5)

H43=1
```

Measurement programs started by H25 – H32

The measurement program associated with the bit will start when the bit goes high. You connect measurement programs to bits in the form ”Give the measurement programs …”. The form displays by ” Utilities / Meas.prog started by H25 – H32 ”.

H33 – H 40

H33 – Mastering

The H33 is high is the same thing as clicking the command button "Mastering" or "Tools/Mastering". It is available for example if you want an external button to start the mastering.

H34 – Transducer test on

H34 has to be (=1) If the test transducers stuck and/or transducers within the specified working interval shall be carried out. This goes for the mastering tests as well.

H35 – Jump to first sequence
H36 – Jump to next sequence
H37 – Jump to previous sequence

For a measurement program divided into sequences the jump preforms when each the bit goes high .Note: To be sure that jump will be carried out, the non-current bits must be set to 0. For example, to jump to the next sequence set H36 = 1 and set H35 = 0 and H37 = 0.

H38 – Click Return on the key board

When H38 goes high is the same as when you press Return (Enter) key on your keyboard.

H39 – Not used

H40 – System OK
H40 (= 1) if M7005 is running OK. The ”Status” square is green and OK, If H40 = 0 is the square red and ERROR..
H40 goes zero

- M7005 is starting.
- An Io server is failing.
- Transducers test indicates an error
- M7005 shut down
- The real time thread is stopped

H41 – Send Zero Data Out
When H41goes high, corrections = 0 will be send to the CNC machine.

H42 – Data Out disabled
If H42 = 1 sending corrections to a CNC machine is disabled
Note, Sending Zero Data Out is not effected,

H43 – Set to zero when a measurement programs plc program is loaded
This is the only digital bit affected by the M7005 changing Plc program. PLC programs are changed when the measurement program is changed. H43 sets = 0 then a Plc program is loaded. This feature is available in order to make initializations at plc program starts up.
Note: All other bits I1-I40, H1-H42, H44-H48, Q1-Q40 are not effected of a Plc program start.

H44 – First part
If H44 = 1 overrides the selected Data Out strategy and that until H44 becomes zero (low).

As long as the H44 is high, sends the uncompensated measurements values just as they are to the CNC machine .M7005 controls the H44 value then the registration order goes low i.e. when M7005 send out the correction values.
Feature is designed to give the possibility to send out 100% compensations after a tool machine stop.

H45 – Internal use

H46 – H48 Not used

The result flags S1 – S 8

S1 – Over tolerance
S2 – Over test
S3 – Under test
S4 – Under tolerance
Results flags is calculated continuously as long as the measurement order is high. When the measurement order goes low the result is frozen.
.

S5 – Mastering request
S5 sets high when the time for mastering has expired, then the H33 goes high, or the operator request mastering by the “Dimension Display” drop-down menu or mastering button. S5 sets = 0 then mastering is ready.

S6 – Transducer error

S6 sets = 0 when the measurement order goes high.

The condition for the transducer test to be enabled are, H34 is = 1 and
”Test On” in the form ”Specify Transducers” is checked.

If the application is divided into sequences, only the transducer used in the current sequence participates in the test.

Check if transducer is stuck

The control starts when the measurement order goes high and the results are recognized when the registration order is low.
If there is a sensor that has not moved more than 0.1 mm, an error message pops up and flag S6 (Transducer error) sets = 1. When the error message is acknowledged S6 sets = 0.

Test transducers within there working interval

The control takes place continuously as long as measurement order is high. If any of the transducers is outside the specified limits, an error message pops up, bitten H40 (System OK) sets = 0 and S6 (Transducer error) sets = 1.
H40 sets = 1 after the operator has acknowledged the error message while S6 remains high (1) until the next time the measurement order goes high. The interval that the transducer has to be within is given in the form ”Specify Transducers”

S7 – Mastering Error

S7 sets = 0 when a mastering starts.

Test transducers within mastering interval

During the mastering the transducer values are tested if there values are within de specified mastering intervals. If not an error sign pops up and S7 sets = 1. The interval that the transducer has to be within is given in the form ”Specify Transducers”

Drift test

If the zero difference between the current mastering and the mastering before exceed specified drift interval, a warnings sign pops up. S7 (Mastering error) sets = 1.
The drift interval is defined in the form for specifying dimensions

S8 - Measurement values are reasonable

If any measure is out of (tolerance width * X), where X is given when the measurement program was defied, S8 sets = 1. S8 stets = 0 when the operator notifies the error message,

Flags displaying the measure results S9 – S18

S9 – XBar over control limit

S10 – XBar under control limit

S11- R out of control limit

The bits sets to zero when the registration order goes high, and sets when the registration order goes low.
The test is made when the spc group becomes full.
The flags always resets when the registration order goes high, at system startup and change of batch.

S12, S13 Not used

S14 –S16

For measuring program divided into sequences, these bits shows witch sequence is active.
The bits shows the sequence number binary. S14 = 1, S15 = 2 and S16 = 4. For example if S14 = 1, S15 = 0 and S16 = 1 is the current sequence = 5.